Health and Disease in Chalcolithic Cyprus
A Problem-oriented Palaeopathological Study of the Human Remains

Thesis submitted in requirement for the degree of Doctor of Philosophy by:

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This thesis is based partially on unpublished material. Any results and interpretations relating to the site and skeletal series of Souskiou-*Laona* Operation C contained within this thesis are to be considered preliminary. Permission to quote the thesis sections on Souskiou-*Laona* Operation C must be obtained both from the PhD candidate, as well as from Dr Kirsi O. Lorentz and Prof. Edgar Peltenburg.

The map images (Figures 3.242, 3.243, 3.244) are based on unpublished maps by Ben Blakeman and it is with his permission that they have been adapted within this thesis. They cannot be reproduced or adapted without his consent.

Abstract

Poor preservation of the human skeletal remains on Cyprus has, in the past, limited palaeopathological analyses conducted. The research presented here has two main aims: (1) to explore the possibility of deriving useful information from the poorly preserved human remains from Chalcolithic Cyprus and the methodological adjustments required to do so, and (2) to discuss the health status of the human Chalcolithic populations in Southwest Cyprus, determining patterns in the expression of pathologies related to age, sex or burial location which, if present, may further elucidate aspects of lifeways within and amongst the living populations. These aims are achieved through a macroscopic and microscopic analysis of the pathological lesions on the human skeletal remains from the Souskiou-*Laona* cemetery, the Lemba-*Lakkous* and Kissonerga-*Mosphilia* settlement sites which all date to the Middle Chalcolithic period. This research presents one of the first comprehensive palaeopathological studies for the Chalcolithic period in Cyprus with multi-site data. Lesions arising from osteoarthritic processes, non-specific diseases and disorders as well as trauma, dental pathologies and congenital defects are recorded, analysed and discussed within the archaeological context. The results presented in this thesis show that information regarding prehistoric peoples can be drawn from poorly preserved remains and it goes further to explore the limitations to the interpretations which can be postulated. The analyses of the research indicate that there are moderate to low prevalence of pathological lesions observed on the Chalcolithic skeletal remains. There is differential expression between males and females in the joints affected by osteoarthritic changes and the types of dental pathologies suffered by each sex. This research contributes to the overall historiography of health and disease in Cyprus, by filling a lacuna for the Chalcolithic period. Additionally, it provides an illustration of some methodological modifications, such as qualitative discussion, needed when dealing with poorly preserved and commingled material in a palaeopathological study.

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Please not that all photographs are taken by the author unless otherwise noted and cannot be reproduced without permission. All scales are 1cm unless otherwise noted.

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<u>Abbreviations used within this text</u>

CBA = Cannot Be Assessed - Refers to aspects of the skeletal analysis, either age or sex estimation, or for pathologies which could not be assessed due to preservation issues.

N/A = Not Applicable – Refers to an analysis which was not possible due to missing information, or no pathologies observed.

MNI = Minimum Number of Individuals

PE = Proximal Epiphysis – Refers to the proximal epiphysis of a long bone, metacarpal, metatarsal or phalanges.

DE = Distal Epiphysis - Refers to the proximal epiphysis of a long bone, metacarpal, metatarsal or phalanges.

OA = Osteoarthritic changes – Often used in palaeopathological studies to represent osteoarthritis, it has been adapted here to reflect the fact that osteoarthritis cannot be diagnosed within these skeletal collections.

LEH = Linear Enamel Hypoplasias – Refers to a dental defect representing a non-specific metabolic disruption during tooth crown formation.

AMTL = Ante-Mortem Tooth Loss – Refers to teeth lost during life.

MC = Metacarpal

MT = Metatarsal

SL = Souskiou-*Laona*

LL = Lemba-*Lakkous*

KM = Kissonerga-*Mosphilia*

Chapter One: Introduction

> ‘Disease is an inevitable part of life, and coping with disease is a universal aspect of the human experience. … The experience of disease, by individuals or whole populations, is as inescapable as death itself’ (Brown *et al.* 1996: 183).

In prehistory, where there is no textual evidence and little artistic evidence, human remains provide the primary resource for the analysis of what types of diseases and physical stresses people may have encountered and how these pathologies may have impacted their lives. Due to preservation issues of skeletal tissue on Cyprus, studies of archaeological human remains have been slow to gain appropriate recognition for their informative possibilities within the overall archaeological record of past populations. However, with advances in the theory and methods of osteological analysis and the recent complete excavation of the first Middle Chalcolithic (c.3000 BC) cemetery at Souskiou-*Laona* (Operation C), the opportunity to provide a comprehensive bioarchaeological study is presented, and will evidence how this research can augment the overall archaeological record in prehistory. Two main questions are addressed within this thesis:

(1) Can the poorly preserved human remains from the sites of Souskiou-*Laona* (Operation C), Lemba-*Lakkous* and Kissonerga-*Mosphilia,* dating to the Chalcolithic period in Cyprus, be used in a palaeopathological analysis?

(2) Are there patterns in the type or prevalence of pathological lesions based on sex, age or discrete mortuary feature within the Chalcolithic skeletal series?

   a. If there are patterns of pathological prevalence or type amongst the skeletal collections, what, if anything, can the patterns indicate regarding lifeways and social structure within the Chalcolithic populations?

These aims are achieved through a macroscopic and microscopic palaeopathological analysis of the human remains from three of the most extensively excavated Chalcolithic sites on the island. The research presented here hypothesizes that despite the poor preservation of the human remains from the Chalcolithic period in Southwest Cyprus, a palaeopathological analysis of the skeletal remains is possible, and can provide useful information towards understanding the health status of the three discrete skeletal series' studied. It is postulated that patterns in pathological expression will emerge amongst the three sites, based on age and sex assessments of the individuals within the samples and these results can be discussed within the context of some of the social relationships within the populations. This thesis presents one of the first comprehensive problem-oriented palaeopathological studies for the Chalcolithic period in Cyprus utilising multi-site data. The Chalcolithic cemeteries at Souskiou represent the earliest discrete cemeteries in Cyprus, and the cemetery named Souskiou-*Laona* (Operation C) is so far the only completely excavated discrete cemetery in Cyprus, and as such provides an excellent opportunity to examine in detail a fairly complete skeletal collection from a specific period and a well-defined location (Appendix A provides a table of the cultural periods and their associated dates on Cyprus). This study will contribute to the overall historiography of health and disease in Cyprus. Additionally, it provides an illustration of some necessary modifications to methods needed when dealing with poorly preserved and commingled material in a palaeopathological study.

The study sample consists of a minimum of 125 individuals from 27 burial contexts from the Souskiou-*Laona* cemetery (Operation C), 58 individuals from 47 burial contexts from the Lemba-*Lakkous* settlement and 80 individuals from 62 burial contexts from the Kissonerga-*Mosphilia* settlement site. The human remains from the other Chalcolithic sites with human remains, namely, Souskiou-*Vathyrkakas,* Kissonerga-*Mylouthkia* and Erimi-*Pamboula*, are so highly fragmentary and/or limited that there is little opportunity to form comparisons. Therefore, as the most extensive skeletal samples recovered thus far from the Chalcolithic period, the sites of Souskiou-*Laona*, Kissonerga-*Mosphilia* and Lemba-*Lakkous* provide the best possible representation of the Chalcolithic populations available. The minimum number of individuals, sex, age-at-death and pathologies were assessed from the skeletal remains from each site by the author for the purpose of this thesis. The prevalence of specific pathologies were calculated by individual and bone element to reflect the overall prevalence within the skeletal populations and discrete mortuary feature to reflect the distribution of the observed pathological lesions amongst the three sites (see Chapter Two for methods of assessment). The results of the palaeopathological analyses will be discussed within the context of the archaeological evidence for the Chalcolithic period on Cyprus to consider elements of the possible social structures (see Chapter

Four for discussion on social status and biological status). ‘Chapter One’ introduces the research for this thesis within the disciplines of palaeopathology, bioarchaeology and the history of medicine and includes previous work within these fields in Cyprus. As well, the archaeological and environmental context of the living populations in the Chalcolithic period will be presented as they relate to the palaeopathological study of the human remains. ‘Chapter Two’ presents the skeletal samples which form the basis of this study and the methods which are used and why they were selected for the analysis of the human remains. The results of palaeopathological assessment are given in ‘Chapter Three’, analysing the human remains by individual, skeletal element and discrete mortuary feature. ‘Chapter Four’ provides the discussion of the results of the analysis within the context of the archaeological evidence from the Chalcolithic period, incorporating inferences about the living populations and some of the issues and solutions for dealing with poorly preserved skeletal tissue. ‘Chapter Five’ contains the concluding remarks regarding the results of this research and its place within the disciplines of palaeopathology, bioarchaeology and history of medicine. Interpretations of the inferences from the results of the palaeopathological analysis regarding the Chalcolithic populations and further avenues of research are also summarised in the final chapter.

1.1 Chapter Outline

Chapter one is intended to place this study within the current milieu of the disciplines of palaeopathology, bioarchaeology and the history of medicine through a brief synopsis of each discipline and their previous application in studies on Cyprus. More generally, this chapter will provide some contextual information regarding the island of Cyprus and influences affecting the health of the human populations, as they pertain to palaeopathological studies. Palaeopathological analysis within a bioarchaeological approach allows for a greater depth of understanding of the causes of and experience with disease within the discrete skeletal series’ and amongst three populations studied. Therefore, after a brief discussion of palaeopathology and bioarchaeology and its prior research in these fields in Cyprus, the bulk of this chapter will focus on the archaeological context from which the skeletal samples are derived. Within this section, the influences which could affect the general health status of the skeletal populations under study will be examined. The discussion will focus on Cyprus and briefly touch upon aspects of the broader subjects of island insularity, humans and their environment and more specifically some of the aspects affecting the Chalcolithic populations, such as cultural and biological affinity with the surrounding areas and material culture indications of lifeways and social structure for the Chalcolithic period in Cyprus. This is achieved through a basic synopsis of some of the more pertinent archaeological studies published which will provide a context for the individuals represented by the skeletal remains under study. Following this will be a literature review of the previous physical anthropological studies in Cyprus as a means of placing the current study within a tradition of physical anthropology in Cyprus. The final section in this chapter frames this study within the study of the history of health, disease and medicine on Cyprus.

1.2 Bioarchaeology

In his 1997 book, *Bioarchaeology: Interpreting behaviour from the human skeleton*, Larsen laments the treatment of human remains by many archaeologists, but offers hope for the future stating that archaeologists are more commonly incorporating human remains into their research designs (Larsen 1997: 1-2). He claims that: 'The enormous potential of bioarchaeology for understanding the past has only recently become realized' (Larsen 1997: 3). However, there have been substantial advances in the technology and methodology within human remains studies worldwide in the last decade. The growing dominance of bioarchaeological studies within the fields of human osteology is perhaps best observed in the recent publication of Buikstra and Beck's *Bioarchaeology: The Contextual Analysis of Human Remains* (2007). This innovative book provides a history of the evolution of bioarchaeological methodology within the wider fields of archaeology and anthropology.

Bioarchaeology provides an interpretive framework for adding to the understanding of past populations through their human biological remains (Roberts 2006: 438; Walker 2000). A bioarchaeological approach provides the theoretical background for this study by encouraging the integration of the biological data from the human skeletal remains with the archaeological data to answer questions about the Chalcolithic populations (as per Buikstra and Beck 2007: xix). An exact description of what bioarchaeology entails is difficult to determine as slightly different definitions are presented by Larsen and Buikstra regarding the bioarchaeological approach (Buikstra and Beck 2007: xviii-xix; Larsen 1997: 3). According to Larsen, the term ‘bioarchaeology’ refers exclusively to archaeological human remains with special reference to how human remains are relevant to the study of the human condition and human behaviour generally (Larsen 1997: 3). ‘Central to bioarchaeological inquiry are the interaction between biology and behaviour and the role of environment on health and lifestyle’ (Larsen 2002: 119). Buikstra’s definition of ‘bioarchaeology’ focuses on the ‘reconstruction of human histories with emphasis on anthropological problem-solving and the integration of archaeological data’ (Buikstra and Beck 2007: xix). Buikstra’s approach is multi-disciplinary, encompassing: human osteology, funerary practice and social organization, daily activities and division of labour, palaeodemography, population movement and genetic relationships and diet and disease (Buikstra 1977: 67). While not totally incompatible, Larsen places the emphasis strictly on the human skeletal remains whereas Buikstra promotes a more integrated approach with the human remains used to discuss a variety of topics in a specific sequence to avoid bias (Buikstra and Beck 2007: xviii-xix). ‘Bioarchaeology’ is used within this thesis to refer to the integration of data collected and interpreted from human skeletal remains with the archaeological interpretations (as per Buikstra and Beck 2007: xix)

1.3 Bioarchaeological Studies on Cyprus

Some of the roots of the bioarchaeological framework can be seen in, among others, the work of J.L. Angel, and his studies of past Greek societies, particularly on Cyprus, in which biological change was discussed in the context of historical and cultural change (Buikstra and Beck 2006: xix; Buikstra and Lagia 2009: 9). Unfortunately, the great potential of human remains in problem-oriented[1] archaeological studies is only become realized on Cyprus over the last ten years. The use of the bioarchaeological framework within Cypriot human remains studies has been rather limited in the past. However, current research is embracing the approach with vigour and a diverse range of interests (see i.e. Baker *et al.* 2007; Fox 2005; Harper *in press*; Harter-Lailheugue *et al.* 2005; Le Mort 2000, 2007, 2008; Lorentz 2006, 2008a, 2008b, 2008c, 2009, 2010; Parras 2004, 2006; for further references see Lorentz 2011).

[1] Problem-oriented, as used within this study, refers to studies which seek to not simply present biological data collected from human skeletal remains, but which incorporate an anthropological or archaeological problem or question which they aim to answer using the biological data collected from the human skeletal remains (as per Buikstra and Beck 2007: xviii).

Harper and Fox (2008) have published a comprehensive review article on the history of bioarchaeology on Cyprus. They include a bibliography of osteological studies as well as a well structured discussion of the history and state of human remains studies on the island. Their paper provides examples of the progress in methods and analysis which are currently occurring on the island through a review of the previous work and discussion of future study which is taking place on Cyprus. Research regarding ante-mortem tooth loss, implications of burial practice to the study of human remains, bio-distance relationships based on craniometric data and chemical testing on the dentition are currently the only bioarchaeological studies for the Chalcolithic period in Cyprus located (Lorentz *forthcoming b*, 2010; Harper 2003; Cook *et al. in preparation* respectively). The research presented within this thesis provides an addition to the palaeopathological analyses from Cyprus and takes an integrated approach to biological information with the archaeological information.

1.4 Palaeopathology

> 'Paleopathology encompasses the study of disease, both human and nonhuman, in antiquity using a variety of different sources including human mummified and skeletal remains, ancient documents, illustrations from early books, painting and sculpture from the past, and the analysis of coprolites' (Ortner 2003: 8).

Palaeopathological analyses have a long history within archaeological studies in an attempt to gain a greater understanding not only of the diseases suffered by those in the past, but to gain a better idea of where and how diseases originated. Creating a worldwide, comprehensive histiography of disease will provide the opportunity to trace various pathologies throughout time and place. Therefore, the research presented in this thesis contributes to this histiography with an analysis of the pathologies observed in Chalcolithic Cyprus. However, to paraphrase Keith Manchester's presentation at a recent conference, it is important that we understand that behind the bones we are dealing with real people and if we will ever have real understanding of their life experiences we must think about the pain and suffering they may have felt when dealing with these symptoms of the lesions we study (2009). The purpose of the research presented in this thesis is to provide an additional strand of information for understanding the lifeways of those in Chalcolithic Cyprus through the expression and patterning of pathologies on the skeletal remains of the individuals who lived and died during that period. In regards to terminology, while the term 'health' is used within this research it is not technically possible to study health in prehistoric archaeological populations as the true definition of health involves too many variables which cannot be assessed through palaeopathology (Waldron 2009: 9-10). This study therefore examines the presence of disease through pathological markers on the human skeleton. It is important to remember in the interpretations that the absence of pathological lesions does not necessarily indicate a healthy individual, as osseous changes due to disease only occur in chronic cases and where an individual survives long enough for the disease to affect the skeleton (see below for discussion of the osteological paradox).

Pathologies or pathological markers are abnormal changes to the skeletal tissue caused by pathogenic, autonomic, mechanical, genetic or chemical means (Ortner 2003: 48; Roberts and Manchester 2005: 21). These changes take place in two basic ways, with the formation (osteoblastic activity) or destruction of bone (osteoclastic activity) (Ortner 2003: 45-48; Roberts and Manchester 2005: 7). While the observation of skeletal abnormalities can be accomplished with basic knowledge of 'normal' skeletal morphology, recognizing an abnormality simply allows the observer to note that that individual experienced a pathological change. Diagnosis based on pathological changes to the skeleton can be very complicated as in many cases the whole skeleton needs to be considered to indicate which disease was present through the pathological lesions (Roberts and Manchester 2005: 3). Diagnoses should err on the side of caution and all possible causes of the pathology should be considered in order to avoid over-confident interpretations of pathological prevalence (Ortner 2003: 111-112; Roberts and Manchester 2005: 6; Waldron 2009: 2-3). When examining a skeletal collection for pathologies, in order to make interpretations regarding the living populations represented there are a number of limitations which must be considered.

Palaeopathological studies are not only limited by issues with diagnosis based on the reliance on clinical studies, but also issues of the nature and aetiology of the bone changes and sampling (see Chapter Two materials section for discussion of the sampling strategy of this study). For further discussion on the limitations of palaeopathological studies see: Ortner (2003: 111-118), Roberts and Manchester (2005: 12-14) and Waldron (2009: 6-9). In regards to sampling bias, palaeoepidemiological studies reflect that an archaeological sample of human skeletal remains is inherently biased based on recovery, taphonomic processes and depositional biases. This must be considered when making statements about the living population (Waldron 2007:28-29). Several authors have made reference to the 'osteological paradox' which essentially focuses on the possibility of misrepresenting disease prevalence within a population due to fluidity in the demography, selective mortality (meaning a young individual's skeleton with no pathological lesions was not necessarily healthy in life) and heterogeneity of the sample based on hidden causes (such as genetics) (Robb *et al*. 2001: 214; Roberts and Manchester 2005: 7; Wood *et al*. 1992: 244-245). There are several rebuttals to this argument, claiming that this is an overly pessimistic approach to palaeopathological studies (see Buikstra and Lagia 2009: 15; Goodman 1993). For example, the argument that the mortuary population does not reflect the living can be countered using multiple lines of evidence and by avoiding equating living populations from the period and archaeological skeletal samples (Buikstra and Lagia 2009: 15). Every individual's response to disease will be different, further complicating diagnosis.

With regards to pathological expression, the effect of a physiological stressor on an individual is due not only to the characteristics of the stressor, but also to the individual's biological response to the stress (Goodman 1991: 286). Survival depends on the individuals' ability to adapt to their environment and combat stress and disease (Ramenofsky *et al*. 2003: 251). Previous studies indicate that there is a certain cultural buffering involved in physiological stress and that there are those who are able to avoid stress due to differential social status which can have an impact on longevity and the extent of survival of non-lethal pathology (Goodman 1991: 284). Exposure to a pathogen does not always lead to disease. If a disease is particularly acute it will leave no mark on the skeleton (Gold 1999). A lesion will only form on the bone in chronic cases of disease and intrinsically this means that the individual was able to survive long enough for the lesion to form. Does this make them healthy or unhealthy? Debate continues on this subject (i.e. Buikstra and Lagia 2009: 15; Cohen *et al*. 1994; Goodman 1993; Larsen 2002: 142; Milner *et al*. 2000; Wood *et al*. 1992; Wright and Yoder 2003). Therefore when approaching a skeletal sample numerous issues must be kept in mind regarding the interpretations as there is no way to definitively answer these questions: how representative is the sample of the living population? How representative of the health status of the population are the pathological lesions present? Keeping these questions in mind when making interpretations based on pathological analysis will help to avoid making absolute statements about the living population which may not be an accurate reflection of the pathological lesions observed.

Palaeopathological analysis is one of the strands of research which can contribute to the interpretations of the social and cultural context of the population under study. There are numerous studies which compare status markers and health markers to discuss differential health amongst past populations (i.e. Ambrose 2003; Buzon 2006; Cohen 1998; Cucina and Işcan 1997; Danforth 1999; Emery 2003; Pechenkina and Delgado 2006; Powell 1988; Rathburn and Scurry 1991; Robb *et al.* 2001; Welch and Scarry 1995; Wentz *et al*. 2006). The research presented within this thesis intends to discuss the patterns, types and prevalence of specific pathologies in regards to possible indications of social structure within the Chalcolithic populations. Attempting to establish a relationship between health, based on skeletal lesions, and social status based on funerary treatment, within archaeological populations is complicated by several issues. First of all, there must be an archaeologically observable stratified hierarchy within the community which are then reflected in non-homogeneous skeletal indicators of pathology reflecting differential physiological stress (Robb *et al.* 2001: 213). Secondly, the funerary treatments of the individuals within the population must reflect the status of the living individual, which is complicated by issues of burial ritual and belief systems (see Parker Pearson 1999: 72-94 and references within, for a discussion of the perils of using funerary treatments as a reflection of the status of the dead). Finally, the health of the living individual must be reflected in the observable pathological lesions on the skeletal remains, which is complicated by the 'osteological paradox' as discussed above (Robb *et al*. 2001: 213-214). This study will not include a comparison of the funerary treatments (including grave goods and mortuary feature architecture) due to the unpublished nature of the Souskiou-*Laona* cemetery. Future research should incorporate all strands of analysis to discuss interpretations of the social structure of populations of the Chalcolithic period, and the implications of health status in association with social status. Within this thesis, the pathologies observed provide the indication of health status and differential expression of pathology type and prevalence amongst the different biological groups based on age and sex will be used to contribute to the discussion of social structure in the Chalcolithic populations.

Pathological lesions result on the skeleton for many reasons (which will be discussed in Chapter Two in regards to specific pathologies observed on the skeletal series' from the Chalcolithic period), however, there are some general aspects of human existence such as nutrition, healthcare and activity which are directly correlated to health. There are many factors which can affect an individual's nutritional condition, including: biological requirements for growth and development, availability of food resources, development of subsistence technology and strategies, and cultural attitudes towards food (Buikstra and Mielke 1985; Wing and Brown 1979: 2-4). The quality and quantity of food consumed can affect health in two main ways. First, if the diet is not adequate it can result in malnutrition which will affect the immune system making it less able to resist disease. Second, if there is a specific nutrient lacking from the diet, it can result in a dietary deficiency disease (Roberts and Manchester 2005: 223). Food procurement and processing were vital activities for prehistoric populations. The skeleton of an individual repeatedly carrying out such activities could possibly display evidence of this through pathological lesions such as: osteoarthritic changes, accentuated entheses or accidental injury associated with intensive labour. (i.e. Molnar 2006; Pechenkina and Delgado 2006; Weiss and Jurmain 2007; Welch and Scarry 1995). The nature of an individual's diet can also predispose them to various diseases and a poor diet will affect normal skeletal and dental development (Roberts and Manchester 2005: 223). In archaeological skeletal collections there are various ways to discuss diet directly, including through stable isotope analysis of the bones and teeth (i.e. Fuller *et al*. 2010; Kreuger and Reesman 1982; Mays 2000; Molleson and Jones 1991; Price *et al.* 1985; Richards *et al.* 2003). Feasibility tests for stable isotope analysis on the human remains from the Chalcolithic period are currently underway (Cook *et al*. *in preparation*). However many indirect ways to discuss aspects of diet exist through an analysis of the available foodstuffs, in the form of archaeobotanical and archaeozoological studies. Recent work on lipid analysis has also expanded the repertoire of methods available to discuss aspects of diet and food preparation (i.e. Steele *et al*. 2010).

Healthcare or lack thereof, plays a role in general well-being of an individual and of the population overall and will impact the lifestyle of the community (Baker and Carr 2002). General deterioration of an individual's health is impacted by the type and intensity of the labour/activities in which they participate. Activity can be inferred through the expression of pathological conditions such as osteoarthritic changes in the joints and/or accentuation of the entheses or Musculoskeletal Stress Markers (MSMs), which involve the accentuation of muscle attachment points on the bone from repetitive use of that particular muscle in a particular manner (i.e. Eshed et al 2004a; Oates *et al.* 2008; Weiss 2008; Wilczak 1998). While the aetiology of specific MSMs will be different for each population based on their activities, in general accentuation of these elements across a population can possibly represent a similar activity and only those MSMs which indicate labour are involved in the discussion of health and disease (Jurmain 1999; Kennedy 1989; Weiss 2008). Therefore, there are a number of avenues of observation available to the researcher attempting to discuss the socio-cultural aspects of health and disease within an archaeological population, such as diet and nutrition, healthcare and labour. Each skeletal series will present its own patterns of anomalies which are potentially influenced by the population's social structure within which they live, eat and work.

The study of health and disease in the past is constantly evolving. Future studies of the health and disease processes on Cyprus will continue to provide invaluable insight into the life experiences of the peoples from all periods. As the archaeological sciences are more widely applied to the skeletal material from Cyprus it is hoped that more concrete understandings of diet, residential mobility, genetic variability and other aspects of human biology in the past will be attained. Recent work at Parekklisia-*Shillourokambos* on palaeoparasitology has provided very positive and encouraging results in regards to diet and gastro-intestinal issues which the inhabitants may have suffered (Harter-Lailheugue *et al*. 2005). Stable isotope feasibility tests on prehistoric remains will hopefully permit further exploration into the diet, nutrition and residential mobility of the populations. Hopefully, with improved excavation techniques and more emphasis on the archaeological sciences, further work in this direction will take place on Cyprus.

1.5 Cyprus: The Island and the Prehistoric Environment

The general health status of an individual is influenced by a number of different factors. Just as that individual will have an impact on the environment and community around them, the general environment and the cultural values and lifeways of the population will impact on the individual (Roberts and Manchester 2005: 15-19). The interactions of humans and their environment are complicated. The concept and definition of environment itself is contentious in regards to what 'environment' actually includes and the impact it may have on humans. These are large methodological and theoretical questions which have been addressed by a number of different scholars (i.e. Coombes and Barber 2005; Judkins *et al.* 2008; Larsen 2006; Roberts and Manchester 2005: 15; Speidel 2000; Steinemann 2000). What is clear from these studies is that in order to understand the possible causes of particular pathologies observed on the skeletal remains, it is important to have a good understanding of the environment in which people lived. The previous section detailed how health can be discussed in the archaeological setting and the following section will provide evidence of the cultural world inhabited by the people whose skeletal remains are being studied. The climate and environment and the human actions within them can affect the types of diseases that can be present, the types of plants naturally available or grown for possible medicines or collected or grown for subsistence, the availability of water sources, the types of structures built and the mobility of the population within their environment. Therefore, this section will discuss these aspects of Cyprus and its environment as it is best understood in the Chalcolithic period in regards to the affect it may have on the health of the living populations.

Cyprus is the third largest island in the Mediterranean Sea and is strategically situated in the eastern corner of the Mediterranean, 75 km south of Turkey, 105 km west of Syria and 380 km north of Egypt and 380 km east of Rhodes (Republic of Cyprus 2006 - Figure 1.1).

Figure 1.1 Map of Cyprus (adapted from Embassy World (1980)).

Its overall shape has traditionally been described as an oxhide ingot covering an area of 9,251 km^2, with its maximum length of 240 km and maximum width of 100 km. There are four main geographical zones on the island including two mountain ranges, the Troodos in south which acts as barrier between the northern Mesaoria Plain and the south coast land and the Pentadaktylos range (Kyrenia) in the north along the northern coast (Constantinou 1982: 15). In geological terms, Cyprus is considered quite new as it was formed in the Miocene period, having been thrust up from the seabed which means it was never attached to the mainland (Constantinou 1982: 15). Therefore, the flora and fauna on the island came by sea or air or was introduced in the Holocene by human actions (Swiny 1988: 3).

There is no current palaeoclimate study of Cyprus. Hadjioannou (1987) completed a report entitled ‘The climate of Cyprus: past and present’, which provides a description of the modern climate and makes inferences to the past climate. Presently, the climate can be described as ‘Mediterranean’ with hot and dry summers and cool, wet winters. The geography of the island has a major effect on the climate around the island and weather may vary considerably across the island. It must be kept in mind that in all likelihood, the current climate conditions may not reflect the climate of the prehistoric periods. Climate plays a role in the health and disease processes affecting a population as various disease processes thrive in particular climates (i.e. Haines *et al.* 2000; McMichael *et al.* 2006; Patz *et al.* 1996, 2005). For example the warm climate with seasonal rain in Cyprus creates standing waters which allowed for mosquitoes to thrive which encouraged malaria, promoting the genetic adaptation of a form of anemia called thalassemia (Angel 1966, 1972, 1978; Clegg and Weatherall 1999; Violaris *et al.* 2009). Climate also affects the kinds and abundance of vegetation and crops which can be grown which can have an impact on the general health status of the inhabitants (Larsen 2006; Patz *et al.* 2005). Today, there are no perennial rivers on the island and precipitation is critical to the survival of the island, with an annual average fall of 503 mm (Papasolomontos 1998). However, it would seem that precipitation was higher and perennial waterways existed in prehistory as noted by Peltenburg in his description of the Skotinis stream near Kissonerga-*Mosphilia* (1998: 1). As well, Cyprus was heavily forested in antiquity and wood was used in various industries with the remnants of the forests still covering the western Troodos and the Akamas peninsula (Raptou 1996: 254-6 regarding the Iron Age and Roman use of wood; Tsintides 1998: 11 discusses the endemic plants of Cyprus).

Because of the interactions of humans with their landscape, understanding the landscape of the Chalcolithic populations will provide a better idea of the nature of some of their activities and possible issues. Various authors have discussed elements of the ancient climate and coastline as well as the earliest human interactions with them (i.e. Held 1989; Cherry 1990; Gomez and Pease 1992). Stanley Price (1979) provides a Gazetteer of the known prehistoric sites, arguing that there has been very little systematic study of the prehistoric environment in Cyprus. He bases his reconstruction on extrapolation from recent and contemporary environments and results from palaeoenvironmental research in neighbouring countries (Stanley Price 1979: 1). The area of interest for this palaeopathological research is the Paphos District, as all three sites under study are within its borders. It is edged by the southern range of the Troodos Mountains to the northeast, and a hilly topography which separates this coastal strip from the rest of the land (Stanley Price 1979: 7). It is mostly limestone plateaus, with a main watershed between the Khrysokhou valley to the north and the slopes facing south and west: an area 'geologically unstable and prone to earthquakes' (Stanley Price 1979: 7). It seems that the river-courses have been fairly consistent with minor changes resulting in meandering within their courses throughout the last 10,000 years (Stanley Price 1979: 8).

Since Cyprus was never attached to the mainland, any plants or animals which arrived on Cyprus did so by air or sea, either by human agency or via independent action. There is a history of island archaeological theory, which considers elements of palaeoenvironment on an island which is isolated from mainland developments, along with concepts of technological, social and cultural changes within an island community (i.e. Broodbank 2000; Cherry 1990; Held 1993; Knapp 2007; Rainbird 1999). These discussions also examine concepts of insularity and connectivity and the influence these aspects have on the overall identity of the island (Broodbank 2000: 1; Finlayson 2004; Knapp 2007: 48-9). The insular nature of Cyprus can have an impact on disease in several ways. First, the mobility of the inhabitants of the island is limited to seafaring which will affect their interactions with their mainland neighbours. Inter-regional mobility can have an effect on the transmission of infectious diseases and congenital defects (Pietrusewsky *et al.* 1997: 337-339). As well, diet will be affected by the insularity of the island as the types and quantities of food which can be procured can be limited (Frankham 2008). While there is some evidence that Cypriot populations moved about the island with the exploitation of fallow deer and picrolite, there is little evidence for external interactions with the surrounding Eastern Mediterranean cultures during the Chalcolithic period (Held 1993: 28; Peltenburg 1991a: 107; Peltenburg *et al.* 1998: 232). Limited interactions with external populations can reduce the number and perhaps type of infectious diseases which can be introduced to the island population (Roberts and Manchester 2005: 18).

The last decade of archaeological research on Cyprus has made a determined effort to gain an understanding of the earliest history of the island (see Appendix A for cultural periods and associated dates from Cyprus). With archaeological excavation and interpretation continuing, our understanding of these complex early periods will evolve. Steel has produced a basic textbook for the archaeology of the earliest periods on Cyprus (2004). This monograph provides a synthesis of the prehistoric periods in Cyprus with references to the key sites for each period and gives a synopsis of the archaeological research conducted for each period in regards to technology, settlement structure and architecture, subsistence economy and mortuary practice and ritual (Steel 2004). There has been a lot of research into the earliest peoples on Cyprus in the last two decades, which is summarised nicely by Knapp (2010). Within this article Knapp explores the earliest evidence of human activity on Cyprus from the Epi-Palaeolithic (c.11-10,000 CalBC) site of Akrotiri-*Aetokremnos* and the current discussion on when permanent colonisation of the island tooth place (Knapp 2010: 85-94; Simmons 1999). At present, while there is no general accord in this matter, archaeological evidence at Akrotiri-*Aetokremnos* does not seem to reflect a site with a long period of use and later sites from the Cypro-PPNA, such as Agia Varvara-*Asprokremnos*, may indicate periods of a more permanent habitation (Knapp 2010: 80 and references within; Manning *et al.* 2010; McCartney 2007, 2010). Knapp concludes that with the current rate of research into these periods on Cyprus the interpretations at this point must remain 'open-ended' (2010: 111). However, he states that recent excavations reflect that 'permanent settlers reached Cyprus over 10,000 years ago, bearing cultivated (if not domesticated) cereals and herded ('managed') animals from the Levantine ('Syro-Cilician') mainland' (Knapp 2010: 111). Several books discussing the pre-pottery Neolithic and later Neolithic periods have placed Cyprus within the context of the Near East and Eastern Mediterranean, based on archaeobotanical, archaeozoological, lithic and other technology studies (i.e. Clarke 2007; Knapp 1994; Peltenburg and Wasse 2004). The research presented in these publications seems to indicate that there was a fairly close association between Cyprus and the mainland Near East, particularly the Levant, in the periods before the Chalcolithic (i.e. Clarke 2007: 1; Finlayson 2004: 15-22; McCartney 2004:103-122). The geographical proximity and possible cultural connection in earlier periods permit a basis for comparison of palaeopathological studies of the populations in the Near East with those from Cyprus where there are no others from the Chalcolithic period on Cyprus (see Chapter Four for further discussion regarding comparison studies).

Analysis of plant and animal remains and the study of artefacts associated with growing and processing foods from the Chalcolithic period can contribute to the general context for understanding pathological lesions which may occur in connection with the subsistence economy. The endemic early Pleistocene mammals which are recorded on Cyprus are the pygmy hippopotamus, pygmy elephant, two types of mouse and shrew (Simmons 1999: 153-170). The Holocene fauna which were introduced in the early Aceramic Neolithic period (PPNA-A) and were continually exploited at varying levels throughout the Neolithic and Chalcolithic periods were the fallow deer (*Dama mesopotamica*), sheep, goat, pig and cattle (Croft 2003; Kolska Horwitz *et al.* 2004; Steel 2004: 41; Vigne 2001). Because Cyprus is an island these animals were selected and brought over from the mainland which in itself is a significant indication of choice in the diet of the prehistoric peoples (Clarke 2007: 57, 58). The domestication of animals brought them into close relations with humans creating a new set of diseases which can affect the human population (i.e. Pearce-Duvet 2006). There are a number of studies regarding the human-animal relationship and the increase in zoonotic diseases which were introduced with the domestication of animals (i.e. Roberts and Manchester 2005: 16, 184 and references within). The Chalcolithic population seem to have been agro-pastoralists with hunting still prevalent, particularly in the early part of the period and decreasing throughout the Chalcolithic period (Croft 1991; 1998). It is suggested that the fallow deer were introduced as a wild species to Cyprus and were intended for hunting purposes, while the pig, goat, sheep and cattle were more likely kept as domestic animals (Croft 1991). The Chalcolithic population would have been in close quarters with several animal species which may have influenced the types of diseases with which human populations had contact.

In regards to the flora, the debate of the inception of the Neolithic package in Cyprus, involves the domestication of a variety of wheats and grasses and the timing of their exploitation and use on the island when compared to the Levant (College 2004; Peltenburg 2004: xvi). It appears that there is very early evidence of domestic glume wheat and hulled barley in Cyprus which necessitate a reappraisal of the rates and dispersals of crops in the PPNB (College 2004: 49, 57). Along with animals, it is generally accepted that certain plants were domesticated and carried over from the mainland to Cyprus (College 2004: 55; Knapp 2010: 111; Peltenburg *et al.* 2000; 2001). Cereals that are considered part of the Neolithic founder crops, including einkorn and emmer wheats and barley (Zohary 1996:143-144) have been indentified at Kissonerga-*Mylouthkia* (Peltenburg *et al.* 2000: 849-850). The endemic plants of

Cyprus are discussed by Meilke (1985) in *The Flora of Cyprus*, which is the definitive guide to the plant life on Cyprus. The results from the archaeobotanical studies from the Chalcolithic settlement sites reflect a varied diet of mixed domesticated and wild plants (Murray 1998: 223). Therefore, in regards to diet, it would appear that a wide number of plants were consumed indicating a possibly diverse diet that can often be a buffer to nutritional deficiencies. The more varied the diet is, typically, the lower chance of missing nutrients and mal-nourishment or starvation that can result from over-reliance on a single source (i.e. Cardoso 2007; Cohen and Armelagos 1984; Roberts and Manchester 2005: 17). As noted above, diet and disease are closely related and a variety of nutrients will directly affect the health status of an individual.

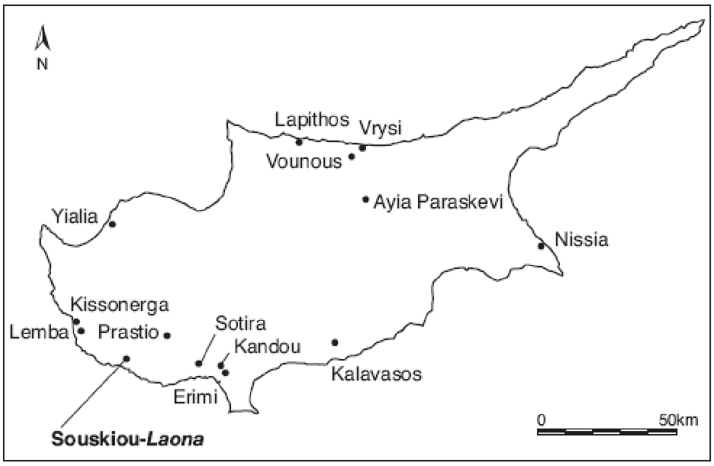
The discussion of the food products available to a population is not only important for understanding the subsistence economy, but also for perhaps gaining an idea of medicines which may have been available and used (i.e. Lardos 2006). It is impossible to know from the archaeological studies or skeletal material whether these food products were used in a medicinal way, but the possibility must be noted. While the nature of the environment may not determine a human population's experiences with disease or trauma, it can certainly play a role in subsistence, the types of diseases present and lifeways including activities which can in turn affect the health of the individual and/or the population. While the general environment and natural resources available will impact the human populations within the landscape, the cultural practices and lifestyle will also have an affect on the health of the individual. The following section will present the archaeological context for the Chalcolithic populations in order to place the skeletal remains into their living context.

1.6 Chalcolithic Cyprus: The archaeological context

The skeletal material which has been examined for this study predominately comes from the Middle to Late Chalcolithic periods (c.3400-2500 BC from Peltenburg *et al.* 1998: 17-18). In order to put the palaeopathological analyses from this thesis into context, it is important to have a background understanding of the lifeways and cultures of the communities from which the mortuary sample is derived. The following section provides basic background information about the Chalcolithic period, as a context for the lifeways of the individuals represented by the skeletal remains examined within this study. There are a limited number of sites from the

Chalcolithic period in Cyprus from which human remains have been derived. Until the excavations at the Souskiou cemetery complex, understanding of the Chalcolithic period was derived solely from the settlement site excavations. This section will provide a general background of the archaeology from the Chalcolithic period with specific reference to the Souskiou cemetery and settlement sites and Lemba-*Lakkous* and Kissonerga-*Mosphilia* (Figure 1.2)

Figure 1.2 Selected Prehistoric sites on Cyprus (Crewe *et al.* 2005:42)

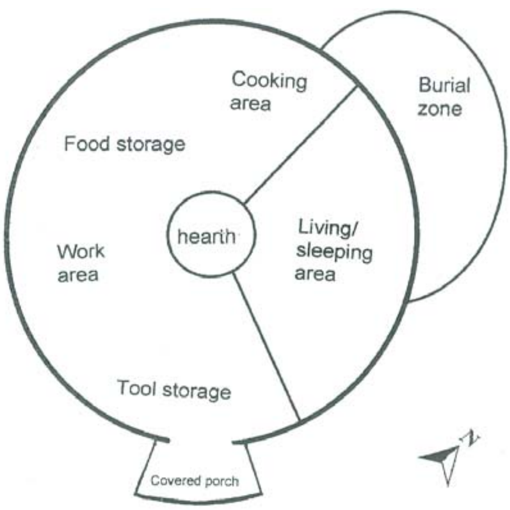


Research on Chalcolithic Cyprus is dominated by the excavations in the southwestern part of the island, under the direction of Professor Edgar J. Peltenburg and the Lemba Archaeological Research Centre (1985; 1991b, c; 1998; 2003; 2006). There have been a number of important settlement excavations, including Erimi-*Pamboula*, Kissonerga-*Mosphilia,* Kissonerga-*Mylouthkia*, Lemba-*Lakkous* and Souskiou-*Laona* settlement (OpA) (Dikaios 1936; Peltenburg *et al.* 1998, 2003, 1985, 2006 respectively; also note Bolger provides lists of Chalcolithic sites in her monograph 1988: 123-126). Settlements within the Chalcolithic period are fairly homogenous in nature (but not size – see below for descriptions), with curvilinear buildings with stone foundations and mudbrick walls, plastered sections of floor and painted decoration on some walls (Peltenburg *et al.* 1998: 237-240). Two discrete cemeteries have been excavated consisting of bell-shaped tombs (with some exceptions) cut into the *havara* limestone; both cemeteries are located at the Souskiou complex – Souskiou-*Vathyrkakas* (Peltenburg *et al.* 2006) and Souskiou-*Laona* (Crewe *et al.* 2005). The studies resulting from the extensive Chalcolithic settlement excavations concern a wide variety of topics including experimental archaeology of housing and house construction, ritual practices, gender relations, ceramics analyses, lithic analyses and faunal analyses (Peltenburg et al. 1985, 1998; Thomas 2005).

1.6.1 Settlements and Domestic Structure

Erimi-*Pamboula* was the first settlement site excavated from the Chalcolithic period, by Dikaios 1933-35 and is a large site which lends its name to the culture associated with this period (Dikaios 1936; Toumazou 1987; Bolger 1988). While Erimi was the earliest and possibly one of the richest and largest sites (at 15 ha), excavations at Kissonerga-*Mosphilia* have expanded the understanding of the chronology and culture of the Chalcolithic period (See Appendix B for the chronology established by Peltenburg at Kissonerga-*Mosphilia*). While there is some variety in Chalcolithic occupation sites across the island (i.e. Kalavasos-*Ayious*, Todd and Croft 2004 and Politiko-*Kokkinorotsos*, Frankel 2010), there are some generalizations that can be made regarding the sites in the Southwest. The domestic structures tended to be curvilinear, and in the Middle Chalcolithic, developed a relatively standardized layout (Peltenburg 1998: 239; Figure 1.3). There is no evidence of defensive or enclosure walls around the settlement sites. Chalcolithic building methods and structure have been studied extensively through experimental archaeology (Croft 1999; Thomas 2005). According to Peltenburg, aspects of social organization may be seen in the diversity of site sizes, where there are clearly densely inhabited large villages, such as Kissonerga-*Mosphilia* (c.12 ha) and smaller, less crowded communities, such as Lemba-*Lakkous* (c.3 ha) (Peltenburg1991c: 17-18). By the later part of the Middle Chalcolithic period, the larger site of Kissonerga-*Mosphilia* also includes a distinct 'high sector' area within the confines of the settlement which has been interpreted by Peltenburg as a possible ritualized area with slightly different architecture in regards to the types of stone used in the foundations (see below for further discussion on the ritual area) (Peltenburg 2002; Peltenburg *et al.* 1998: 244-246). Currently, the settlement site of Souskiou-*Laona* (OpA) is under excavation by the University of Edinburgh under E. Peltenburg, though, thus far, the

Figure 1.3 Plan of domestic space during the Chalcolithic Period (Steel 2004: 88)



buildings follow the same pattern of layout as others in the southwest of Cyprus (Peltenburg *et al*. 2006).

1.6.2 Material Culture

The Chalcolithic period (literally the 'copper-stone') began c. 3900 BC and refers to the time when metal was introduced but not widely used (Karageorghis 2006; Peltenburg 1979a: 18). Therefore, ground and chipped stone technology still played an essential role in the cultural practices of the Chalcolithic period. Beyond the limited use of copper, the artistic material culture of the Chalcolithic period includes the very distinctive picrolite cruciform figures along with other anthropomorphic figures in stone and ceramic (i.e. Tatton-Brown 1979: 19-23; Peltenburg 1991a: 107-126; Goring 1991: 153-162). Picrolite is a light to dark blue stone which was carved, often into anthropomorphic figurines which were sometimes worn as ornamentation (Peltenburg 1991a: 111). Peltenburg describes picrolite as a 'nonessentional, nonutalitarian, "valuable" material, and hence its widespread distribution probably was significant in socio-political contacts among villages' (1991a: 109 – more discussion including picrolite in regards to social structure is below). There are a number of studies on picrolite and its uses in the Middle Chalcolithic period which indicates its particularly significant role in society (i.e. Vagnetti 1974; 1975; 1980; Karageorghis 1977: 27-30; Morris 1985: 122-32; Peltenburg 1991a; Cory Lopez 2005). Interestingly, picrolite pendants are often found within the graves of children. Figurines were carved of other stone types as well and are found in greater quantities in the Middle Chalcolithic than the preceding periods (Vagnetti 1991: 139-151). As well, the development of coroplastic art can be seen in the Chalcolithic period, with anthropomorphic, zoomorphic and fantastic types. 'During the Middle Chalcolithic period, the number of figurines increased and the repertoire expanded' (Goring 1991: 155). Most of the ceramic figurines are painted in a similar manner and made of similar fabric to the pottery of the period. They tended to have an interest in the human form, mostly female, with emphasis on facial features other than the mouth and painted hair (Goring 1991: 155).

Red-on-White ware is the characteristic pottery style for the Middle Chalcolithic period (Karageorghis 1982: 370; Bolger 1991: 81). Pottery typology has long been used to aid with chronology, and the sites of Kissonerga-*Mosphilia* and Lemba-

Lakkous are no different. The large sample number of sherds recovered from Kissonerga-*Mosphilia* aided in the understanding of the evolution of pottery types within the Chalcolithic period and a comprehensive study of the pottery types, motifs, morphology, uses and technology are included within the site report (Bolger *et al.* 1998: 93-147). The period includes a wide range of vessel types which reflect technological advancement and functional variation, which may ultimately stem from growing levels of sedentism, division of labour and craft specialisation. As well, the Middle Chalcolithic holds the first appearance of large scale storage vessels (Bolger *et al*. 1998:145). The settlement sites have provided extensive information on food processing through the recovery of many ground stone vessels as well. Querns, rubbers, mortars, pestles, axes and adzes all recovered from the all the settlement sites seem to indicate a population which was highly involved in the processing of plant material for the purposes of consumption (Peltenburg *et al.* 1998). Overall, the technology, styles and types of artefacts produced during this period seem to indicate a society which evolved over the course of the Chalcolithic period, with their cultural 'florescence' in the later Middle Chalcolithic period (Kissonerga-*Mosphilia* 3b level see Appendix B for chronology - Peltenburg *et al.* 1998: 244).

1.6.3 Ritual Beliefs and Social Structure

There has been much attention paid to the ritual deposit at Kissonerga-*Mosphilia*, resulting in discussions of Chalcolithic gender roles and ritual sites (Bolger 1992, 1994, 1996, 2002, 2003; Peltenburg 1991b, 2002). This deposit consists of a ceramic building model within which were ceramic objects, eight pottery figurines, eleven stone figurines and a number of stone tools, bone needles, a triton shell, and flints (Peltenburg and Thomas 1991: 3-5). Some of the figurines have been closely connected with fertility and birth, with a couple being interpreted as birthing female figures, with a child schematically painted on emerging from between its mother's legs (Goring 1991; Bolger 1992: 149). Bolger discusses the possibility of these figurines representing a votive offering or perhaps use within spiritual remedies for infertility (1992:153). The recovery of this rich deposit from within the 'high sector' of Kissonerga-*Mosphilia* representing public ritual, along with evidence of feasting in this area has prompted Peltenburg to interpret the 'high sector' as a 'Ceremonial' area (Peltenburg 2002: 57-59; Peltenburg *et al.* 1998: 244). Ritual associated with birth and fertility may influence the social structure of a population, as suggested by

Bolger, as females are given a particular status as the propagators of the population (Bolger 1994). The purposeful damaging and deposition of the hoard in the ritual area in the later Middle Chalcolithic period (3B) represents an ideological shift away from earlier beliefs focussing on fertility and birth (Bolger 2002:76).

Peltenburg suggests that the figurines and the rich deposit at Kissonerga-*Mosphilia* can provide a basis of understanding gender relations within the population (2002:53). He points to the purposeful damaging and deposition of the ritual group of female oriented objects as evidence of a change in the relationships between genders and for the creation of a gendered space within Kissonerga-*Mosphilia* settlement in the late Middle Chalcolithic period (Bolger 2002: 76; Peltenburg 2002: 57, 59). The changes in gender relationships have been linked to the changes in the subsistence economy occurring at this time, including increased agricultural intensification and pig management as the reliance on the fallow deer diminishes throughout the Chalcolithic period due to the exploitation of the local forests which drove the deer further away (Peltenburg 2002: 59). Artefacts associated with agriculture have been correlated with the houses, which are more closely connected with females, while males are associated with hunting and herd management (Peltenburg 2002:59). As agriculture acquired a more prominent role in subsistence, Peltenburg hypothesizes that males needed to redefine their social position as females would have been the economic producers, hence the decline in female figurines and changes in birth ideology (Peltenburg 2002: 59-60). Difference in status within the population will only affect the palaeopathological analysis if there is significant difference in nutrition, health, activity, stress or risk amongst the groups which creates consistent patterns of a particular pathological lesion on the skeletons of definable groups (Robb *et al.* 2001:213). Therefore, if both males and females are participating in routine, but different activities, it may only be possible to examine the different types of pathologies and the nature of those pathologies on the skeleton to discuss differences, but not define social stratigraphy.

The figurine studies, in correlation with analyses of spatial relationships within the habitation areas, changing mortuary practices, changes in ceramic and built structures, all indicate that the Middle Chalcolithic period was very dynamic and in flux (i.e. Bolger 1991, 2002; Peltenburg 1991, 1992, 2002). Based on interpretations from

Lemba-*Lakkous* and Kissonerga-*Mosphilia*, Peltenburg and Bolger discuss the increasing social complexity and hierarchy throughout the Chalcolithic period which evolve based on the appearance of a discrete ‘high sector’ of buildings at Kissonerga-*Mosphilia*, evidence of feasting and public ritual, changes in mortuary practice and changes in the subsistence economy (Bolger 2002: 79-80; Peltenburg 2002: 57-58). Peltenburg describes the Middle Chalcolithic population at Kissonerga-*Mosphilia* as a ‘hierarchically divided community’ with centralised authority residing under the control of more influential households or ‘weakly articulated corporate groups’ (Peltenburg *et al*. 1998: 244-247). In the earlier Middle Chalcolithic, picrolite is viewed as a prestige product only accessible to a portion of the population and is indicative of social stratification within the population (Peltenburg 1991a: 114)[2]. Therefore, while the archaeological evidence had been interpreted to reflect a socially stratified population, as noted above, a very particular set of criteria needs to be present to discuss social stratification within an archaeological population based on pathological analyses (i.e. Robb *et al*. 2001). For that reason, the palaeopathological evidence collected for this study can only be interpreted in regards to the gender division (biological groups) of labour and diet (specific pathological lesions observed) which is associated with the Middle Chalcolithic populations. The changes in diet which occur throughout the Chalcolithic period, with greater emphasis on cereal products (Croft 1998; Murray 1998; Peltenburg 2002: 59-60), will not necessarily be reflected in a macroscopic examination of the skeletal material and would be better assessed using stable isotope analysis on a sample of skeletons with good associated radiocarbon dates to track the changes through the Chalcolithic period[3] (i.e. Cook *et al. in preparation*). Overall, the Chalcolithic period seems to demonstrate a number of

[2] Analysis of the context, form and meaning of the anthropomorphic figurines, particularly the picrolite ones, is continually underway with different interpretations based on the theoretical or methodological approach utilized (i.e. Bolger 1992, 1994, 1996; Corey Lopez 2005; Windsor 2009). The association of the picrolite figurines with birth, fertility and death ritual and beliefs seems to be a relative constant throughout these studies. However, the interpretations vary with emphasis placed on gender relations (Bolger 1994, 2002), social complexity (Peltenburg 2002) and death ritual associated with ancestral commemoration (Windsor 2009). As the research conducted for this thesis does not include a discussion of pathologies in association with grave inclusions, there is little scope for discussion on these interpretations at this time. However, the palaeopathological results generated by this research can be used in future analyses of social status and mortuary practice based on a correlation between grave good inclusions and pathological lesions on the skeleton.

[3] Given the longevity of the habitation at Kissonerga-*Mosphilia*, stable isotope testing from this site would possibly supply the most nuanced analysis of changes in diet over time as there are graves dating to all sub periods of the Chalcolithic period within this site. Thus, if stable isotope analysis is possible given the taphonomic processes and bone diagenesis of the skeletal material from Kissonerga-*Mosphilia*, a clearer indication of changing diet amongst the population may be achieved.

social, economic and ideological changes, including the evolution of a new type of burial practice within the society with the advent of discrete cemetery burials in the Middle Chalcolithic.

1.6.4 Mortuary Practice

Intra- and inter-site variation in burial programme is quite high during this period, particularly when looking at Kissonerga-*Mosphilia* and Souskiou-*Vathyrkakas* (Lunt *et al.* 1998: 65-92; Peltenburg 2006: 159-162 respectively). As noted above, the introduction of the extra-mural cemetery is observed for the first time in the Chalcolithic period with the cemetery complex at Souskiou (Peltenburg *et al.* 2006). There are a variety of different grave types which were created and catalogued by Niklasson (1991) in a study of the prehistoric burials uncovered to date. She provides discussion of burial types, inclusions and analysis of funerary procedure by examining around 400 graves from 13 sites in Cyprus dating from ca. 7000 BC to 2300 BC (Niklasson 1991: 1). There are only four sites which contain burials from the Chalcolithic period on Cyprus: Erimi-*Pamboula*, Kissonerga-*Mosphilia*, Lemba-*Lakkous* and the Souskiou complex, all of which are located in the southwest portion of the island.

Niklasson identifies four types of graves at the various Chalcolithic sites, including the common ‘bell’-shaped pit grave found at Souskiou-*Laona*, Souskiou-*Vathyrkakas* and Kissonerga-*Mosphilia* (Niklasson 1991: 4-5). The four grave types established by Niklasson are: (1) pit graves (of which there are three types which will be explained below); (2) chamber tombs – consist of a dromos, either horizontal or vertical and a chamber; (3) pot burials – typically associated with child burials only seen at the later periods of Kissonerga-*Mosphilia*; and (4) burials without pit association – indicates human remains without any proper burial facilities prepared (Niklasson 1991: 4-5). Variety I of the pit graves is present in all periods of prehistory studied by Niklasson. It is described as oval, round, rectangular, square or irregular in plan with straight sides and is typically shallow (c.60cm) with deeper examples at Souskiou-*Vathyrkakas* (Niklasson 1991: 4). Variety II is similar to Variety I but includes an upper bedding or ledge for a cover slab and is cut, typically, into the softer limestone above the bedrock (Niklasson 1991: 4). It has particularly been observed at Lemba-*Lakkous* and Souskiou-*Vathyrkakas*. Variety III is most commonly observed at

Kissonerga-*Mosphilia* and is described as a 'roughly circular hollow with a shelf at one end and an oval grave pit at the other… where the all of the pit would appear to 'bell-out'' (Niklasson 1991: 5).

The simple pit grave (Variety I) was the most commonly used type of grave throughout all the periods examined while the more elaborate pit graves emerges (Varieties II and III) in the Chalcolithic period, as well as chamber tombs with vertical entrances (observed at Kissonerga-*Mosphilia*) (Niklasson 1991: 238). As Variety II incorporates a ledge for a covering slab, it may have been to facilitate re-opening of the grave, perhaps as a result of a desire to reuse a grave or to bury certain individuals together, according to Niklasson (1991: 239). There is great variety in the burial programme at all the sites, particularly at Kissonerga-*Mosphilia* and Souskiou-*Vathyrkakas*, while there tends to be more consistency in the grave types at Souskiou-*Laona* with the bell-shaped tomb. Specific details of the burial programmes employed at the three discrete sites are presented in Chapter Two with a description of each site.

All the known discrete extramural Chalcolithic cemeteries are part of the same complex, near the modern abandoned village of Souskiou. The Souskiou complex is composed of four discrete Chalcolithic cemeteries, two of which have been excavated: Souskiou-*Vathyrkakas* and Souskiou-*Laona*. Souskiou-*Vathyrkakas* was heavily looted and very few graves were found intact. However, those which were un-disturbed revealed an exceptional number and quality of grave goods (Christou and Peltenburg 2006: 8). Compounding the problem of analysis at Souskiou-*Vathyrkakas* is the extremely poor preservation of the skeletal material due to soil and environmental conditions (Peltenburg 2006: 1, 2; Lunt *et al.* 2006: 45). In total, 96 graves were excavated, containing the remains of 206 individuals, including 70 juveniles and 117 confirmed adults (Christou 2006: 37; Lunt *et al.* 2006: 49). The dentition of all the skeletal remains was examined by Lunt (Lunt 1994: 120-128; Lunt *et al.* 2006: 45-53). The highly fragmentary skeletal material was examined by Parras in the recent publication compiling all the information for the site (Lunt *et al.* 2006: 53-66). The mortuary population is composed of a range of individuals, of which adults comprise 71.7% and there is a lack of young children and infants (Lunt *et al.* 2006: 57-58). Apart from a discussion on the stature of the individuals and dental caries there is no assessment of pathologies observed on the skeletal material (Lunt *et* *al.* 2006: 45-66). This will preclude the comparison of the Souskiou-*Laona*, Lemba-*Lakkous* and Kissonerga-*Mosphilia* material with the Souskiou-*Vathyrkakas* publication at this time. Future studies will hopefully be able to incorporate all human remains from this period to produce a larger and more comprehensive sample of the Chalcolithic population.

In regards to grave inclusions or goods, there is a rich assemblage present from the cemeteries of the Souskiou complex. While slightly less extensive, many of the settlement burials at Lemba-*Lakkous* and Kissonerga-*Mosphilia* contain some form of grave good. These predominately consist of pendants, dentalia beads, figurines (both stone and ceramic), ground stone and pottery (Niklasson 1985: 52, 146; Lunt *et al.* 1998: 66-68). Due to the unpublished nature of the majority of the tombs from Souskiou-*Laona*, the current discussion will not include the grave inclusions from this site. However, Souskiou-*Vathyrkakas* can provide an idea of some of the quality and quantity of grave goods which may be typical of the extramural cemetery burials. Peltenburg (2006: 163-174) provides an analysis of the grave inclusions or burial assemblages from Souskiou-*Vathyrkakas*. Grave goods derived from Souskiou-*Vathyrkakas* are particularly abundant for the population and include and unprecedented number of picrolite pendants and figurines, along with dentalia, ground and chipped stone, ceramic and stone figurines and pottery (Peltenburg 2006: 165). There is no correlation between the number of individuals within a tomb and the relative wealth of the artefacts within the tomb, with single individuals sometimes interred with multiple objects (Peltenburg 2006: 164). Due to inconsistent excavation recording throughout the various expeditions to excavate Souskiou-*Vathyrkakas* it is difficult to associate a particular grave object with a particular individual as in many cases there is more than one individual present within the tomb (Peltenburg 2006: 165). Peltenburg concludes that it seems evident from the variety in quantity and quality of burial assemblage within the various tombs, that some individuals were 'more highly privileged than others' (2006: 166). Using the variability of picrolite within tombs, Peltenburg states that the use of this material in personal ornamentation reflects 'statements about group affiliation and status, the groups being adults and children, presumably kin, buried in segregated collectivities' (2006: 167). The research presented within this thesis does not explicitly study the correlation between age or sex and grave inclusions as they may reflect social or economic status and future study should address all aspects of mortuary practice, grave inclusions, burial programme, biological identity and health status for a more comprehensive understanding of social structure and economy.

Females, males and children of all ages were buried at all three sites. There is a predominance of females and subadults within the settlement graves included within this analysis, but there does not seem to be a concrete rule regarding burial location based on sex or age in the Chalcolithic period (further discussion in Chapter Four). Peltenburg highlights the high number of adults compared to children at Souskiou-*Vathyrkakas* and interprets this discrepancy as possibly attached to the practice of secondary movement of the skeletal remains which became quite popular in the Middle Chalcolithic (2006:162 – see also Niklasson 1991 and Lunt *et al.* 1998: 84-85). He states that there is evidence that graves were re-used during this period and adult dead bodies may have been placed temporarily in an internment facility, perhaps in the settlement and extracted for re-burial elsewhere, whereas the children were not necessarily moved (Peltenburg 2006: 163). He uses the high number of partial child burials within the settlements as possible evidence of this and postulates the possibility that the cemetery may have served as a regional depository for individuals from the surrounding area (Peltenburg 2006: 163 - see Chapter Four for further discussion about the origins of the mortuary sample from Souskiou-*Laona*). Overall, there is a variety of burial types and programmes throughout the Chalcolithic sites published to date. This diversity in burial programme does not correlate with the relative homogeneity of the rest of the material culture throughout the excavated sites (see Chapter Four for further discussion) and may reflect different cultural or ritual beliefs across the island. Until further information is gained regarding the origins of the occupants of the cemetery burials it is difficult to determine whether these differences in burial are reflective of discrete populations with distinct burial customs or different groups within a homogenous population.

1.7 Physical Anthropology on Cyprus

This section will begin by tracing the history of approaches to archaeologically derived human remains in Cyprus in order to present the background within which this thesis can be placed. A survey was conducted by the author for the purpose of this thesis to determine the percentage of published site reports that include reference to human remains recovered during excavation. This is included here in an attempt to assess the frequency of occurrence of human remains in Cypriot archaeological sites and to determine the extent of osteological and palaeopathological analyses within Cypriot archaeological reports. Sites which do not record human remains were also included in the hopes of eventually compiling a complete record of all reports on human remains from archaeological sites on Cyprus. It is by no means a comprehensive analysis of the published osteological reports in Cyprus, but rather a sample of some of the archaeological site reports, published between 1920 and 2009. Sites were included as they were encountered through an overview of the *Report of the Department of Antiquities, Cyprus* and the published site reports within the Cyprus American Archaeological Research Institute library which contains an extensive record. The survey included 68 archaeological sites on Cyprus which predominately date between the Aceramic Neolithic and the Early Bronze Age.

Of the 68 reports, 46 record the presence of human remains, in the form of either an osteological report in the appendices or main text body or a description of the skeletal remains in relation to the mortuary feature or grave inclusions. The osteological reports within these studies present standard physical anthropological data with some recording of pathologies where observed but offer no interpretations on the data collected. Of the remaining sites, 18 list no human skeletal remains or record tombs but no bones; two do not have detailed recording of human remains but seem to allude to them; and two sites possibly have remains (*Ais Yiorkis* report does not record any (Simmons 2005) and neither does the Agios Georgios Tis Pegias–*Geronisos* site report (Connolly 2005) but personal communication with P. Croft has indicated their presence). This means that of a sample of prehistoric sites on Cyprus, 67.6% have records of human remains. Of these, four sites, Khirokitia-*Vouni*, Parekklisha-*Shillourokambos*, Marki-*Alonia* and Paphos have had further problem-oriented specialist studies conducted on the human remains (Le Mort 2000; Harter-Lailheugue *et al.* 2005; Lorentz 2006; and Fox Leonard 1997, respectively). This survey indicates that human remains are recovered from a large number of archaeological reports and yet only a small minority have incorporated problem-oriented specialist studies. As well, while there is a long tradition (see below) of physical anthropological studies on Cyprus, palaeopathology has not played a significant role in this research and problem-oriented osteoarchaeological studies are even rarer, particularly for prehistoric sites. Therefore, the research conducted for this thesis will fill the lacuna of the palaeopathological studies in the Chalcolithic period in Cyprus. Please see the Appendix C for a list of sites, their publication information and the references for the bone reports.

The vast majority of site reports which contained human remains typically placed these reports in specialist appendices or within the context of grave construction and burial plan. Two exceptions to this standard mode of publication are from Todd's publications for the Vasilikos Valley Project and Peltenburg's Lemba Archaeological Project. The Vasilikos Valley Project site reports represent the survey and excavation series by Todd and include the examination of the human remains within the main body of the report, assigning the remains a chapter for analysis and discussion (Moyer in Todd, 1989, 2004, 2005 and 2007). Peltenburg's publications for Lemba-*Lakkous* and Kissonerga-*Mosphilia* include chapters on the teeth by dentist D.A. Lunt in the context of the mortuary practices on the respective sites (see Peltenburg *et al*. 1985: chapters 3.4 and 4.4, 1998: chapter 4). The site report for Kissonerga-*Mylouthkia* contains a report on the human remains in the wells by S.C. Fox, M.E. Watt and D.A. Lunt (see Peltenburg *et al.* 2003: chapter 5 and 19). In general, the placement of the remains within the publication in many ways is reflective of the role and importance that the study of human remains has played in Cypriot archaeology in the past.

Where there are no human remains discussed or recorded, unfortunately this does not necessarily preclude there being human remains derived from the site. Early archaeology often did not place great importance on the majority of the skeletal remains, particularly given the poor preservation on Cyprus. In a collection and 'treasure' oriented archaeology, human remains were viewed as disposable and of little informational value (Lorentz 2011). Therefore, they are sometimes not recorded in the catalogue of finds of sites excavated in earlier periods (i.e. Ayios Iakovos: Necropolis of Melia, Gjerstad 1934; Philia-Drakos, Site B, Dikaios 1945; Agia Paraskevi, Hennessy *et al*. 1988; Bellapais-*Vounous*, Stewart 1950). However, as techniques and methodologies both in the field and in the post-excavation analysis have improved, the value of human remains within archaeological studies is being more fully recognized. Despite the issues with preservation, technology and general attitude toward human remains in archaeology there were many intrepid pioneering physical anthropologists who worked on the island. Their studies must be understood within the context of their time and recognition must be given to those whose innovation and foresight advanced the field of physical anthropology.

There is a long history of physical anthropological studies on Cyprus. Beginning in the late 19th and early 20th centuries, physical anthropologists such as Buxton (1920; 1931) and von Fürst (1933) conducted studies regarding cranial modification and regional diversity based on cranial morphology and metric studies. By the mid 1930's there were a number of scholars working with Cypriot skulls to discuss elements of cranial modification, biological affinity and cranial metrics (Hjortsjö 1947; Rix and Buxton 1938 and Schaeffer 1935). Along with craniology, there were a number of archaeological site reports which included appendices containing the analyses of the human remains by specialists (i.e. Guest in Dikaios 1936; Rix in Dikaios 1938; Angel in Dikaios 1953 and Angel in Dikaios 1961). These site reports typically included a list of the bones found within a burial context; a note on preservation, age and sex were provided where possible, and any noted pathological lesions were listed. There was still a focus on the cranium and particularly with the Neolithic remains, reports typically included discussion of cranial modification.

Physical anthropologists J.L. Angel and R.-P. Charles were particularly prolific and influential on Cyprus in the middle part of the 20th century, as physical anthropology was beginning its development into a more modern scientific line of inquiry. Angel's work has been recognized as not only being ahead of its time, but also claiming the early roots of bioarchaeological inquiry (Buikstra and Beck 2006: xix; Buikstra and Lagia 2009: 8). A recent article in *Near Eastern Archaeology* highlights Angels' contributions to Cypriot anthropology, focussing on his important contributions to linking archaeology and physical anthropology through his studies considering the social and biological processes which impact human populations (Harper 2008: 111). Angel's work spanned various periods on Cyprus, and though he tended to focus on the crania, as was typical for the period of scholarship, he leaned away from the pervading race theory typology and created a system of classification based on morphological types (Harper 2008: 113). He contributed to studies of human remains on Cyprus, not only through archaeological site reports (i.e. Appendix II in Dikaios 1953; Appendix III in Du Plat Taylor 1955; Appendix I in Dikaios 1961; and

Appendix B in Benson 1972a), but also in problem oriented discussions of biological diversity amongst regional groups (1972b) and pathological expressions of disease within a regional area (1978).

Charles particularly focussed his research interests on the cranial features. He used cranial measurements to discuss elements of typology and biological affinity. His most noteworthy contribution is his 1962 book, *Le Peuplement de Chypre dans L'Antiquité,* which examines cranial types from the Neolithic to the Roman period on Cyprus, within which he provides cranial types based on morphology and measurements. Charles contributed to a number of archaeological reports (i.e. 1960; 1963; 1964; 1967a; 1967b). Though all of his studies tended to be focussed on the crania, his works take a wider view in many cases, offering comparison between cranial characteristics noted at a variety of sites. He should also be credited with using a chronological approach to his discussions of changing morphology and biological affinity, providing an evolutionary progression of cranial change.

These early roots of physical anthropology on Cyprus were continued and expanded upon throughout the 20th century. Studies of human remains from the 1970s and '80s on Cyprus are predominately found in the appendices of archaeological site reports (i.e. Domurad 1986, 1987a, 1987b, 1988; Galloway 1985; Moyer 1984, 1985, 1989; Schulte-Campbell 1983, 1986, 1989; Schwartz, 1974; Soliveres 1981; Walker 1974-5). Domurad's unpublished PhD, 'The Populations of Ancient Cyprus,' presents human remains from excavations of sites covering a number of millennia, where she discusses aspects of health. However there are some issues with the osteological methods and interpretation employed within this thesis as she places great emphasis and extensive interpretations on a very small sample size from very different sites and very different chronological periods (1986: 1-6). The results gathered by Domurad may be slightly exaggerated based on her methods which included sexing long bones from robusticity and in general some consideration may need to be taken when using these results in comparison studies (1986: 8). There are, however, signs of change and evolution of anthropological approaches, particularly towards specialist reports with focus on dentition (Lunt 1985), as well as discussion of more problem-oriented studies regarding dentition and cranial traits (i.e. Fischer 1986; Fischer and Norén 1989).

The end of the 20th century continued with the tradition of placing the human remains in the appendices of archaeological site reports. However, these accounts begin to include some analysis of the pathology observed on the skeletal material. There is still little problem-oriented discussion, but there is more emphasis on demography and associating the skeletal remains with the cultural archaeological data (i.e. Agelarakis *et al.* 1998; Chapman 1998, 1999; Domurad 1992, 1996; Fox 1993; Fox Leonard 1996, 1999). Fox Leonard's unpublished PhD thesis, 'Comparative Health from Paleopathological Analysis of the Human Skeletal Remains dating to the Hellenistic and Roman Periods, from Paphos, Cyprus and Corinth, Greece,' (1996) is one of the earliest problem-oriented palaeopathological studies using Cypriot material (elements of this thesis are published in Fox 2005, Chapter 3). She produces a comparative study of the evidence of health and disease for two skeletal collections from different Mediterranean populations. Her analysis begins with an examination of the basic demographics of the population and stature estimation. This is followed by a detailed comparison of dental anomalies and pathologies and skeletal lesions and growths. She concludes with the prevalence of three diseases; brucellosis, echinococcosis, and thalassemia and an explanation of some of the issues of understanding diseases in the past (468; 475). Fox Leonard integrates the physical anthropological examination with a discussion of the past environment, which aids in understanding the expression of disease within the populations, particularly thalassemia (18-33). Her approach aims at placing the two communities in the context of their period through a comparative assessment of health and disease processes at work in each sample.

At the end of the first decade of the 21st century, the developments in the methodologies and theories regarding the study of human remains can be seen emerging in the problem-oriented research on Cyprus. Recent studies of biological affinity and palaeopathology investigate sites from the Bronze Age and later periods of Cypriot history (i.e. Agelarakis 1997; Fischer 1986; Fischer and Norén 1989; Lorentz 2001; Parras 2004). While there are beginning to be more specialized publications focussing on specific aspects of health and disease in past populations, as of yet, there is no comprehensive palaeopathological study of the Chalcolithic period on Cyprus. The future of osteological studies on Cyprus is very bright with the possibility of more innovative methodological strategies being employed (Harper and

Fox 2008: 20). While there is still a necessity for the general human osteological report within the archaeological site report, problem-oriented specialist studies are essential to pushing forward our knowledge of past peoples. As the above discussion highlights, the need for more comprehensive analyses of the archaeological human remains in Cyprus is great. This thesis will provide an example of the uses of human remains analyses within the wider scheme of archaeological investigation.

1.8 The History of Medicine in Cyprus

'The study of disease in earlier societies stands firmly in the purview of the discipline of the history of medicine' (Waldron 2007: 1).

A part of this study is to contribute to the overall understanding of health and disease processes on Cyprus. The History of Medicine encompasses a large body of evidence, methods and topics (i.e. Nutton 2005; Porter 1997). To understand the human experience with disease in any period, in any part of the world is to gain a better understanding of what it is to be human. All people in all parts of the world at any point in history have had to deal with issues of illness, aging, pregnancy, injury and a multitude of other physiological stresses. In order to understand medicine and possible treatment or caregiving within a community, one must first have a good understanding of the disease and trauma which the population faced. Inherently, medicine and disease are linked. To understand disease and trauma in the prehistoric period, there are no written texts to describe or allude to medical practices, medicines or peoples experiences with stress and disease, therefore, the human remains provide the most relevant source for exploring disease processes within a population.

Cyprus seems to have been a centre for medical practice for many centuries in antiquity with reference to the Asklepieion located in Nea Paphos and sources for Ancient Kition. There are a number of ancient references to doctors on Cyprus beginning as early as the Phoenician period in the 10th century BC (Pastides 2010). In antiquity, Cyprus seems to have been influenced by medical knowledge from both the West and the East. There is a fourth century BC physician called Syennesis of Cyprus who is quoted by Aristotle for his understanding of the origin of the veins. This same passage is used in the *De Ossium Natura* of the Hippocratic Collection (Smith 1870: 948). Wallace and Orphanides' *Sources for the History of Cyprus* Volume 1 contains a number of references by ancient authors to medicines and herbals derived from Cyprus (1990). Early medical treatment was often closely linked to beliefs in the gods and the injured or ill would seek advice and treatment in sanctuaries, known in the Greek world as Asklepieions. There is one of these sanctuaries in Hellenistic/Roman Nea Paphos (Daszewski and Michaelides 1988). A quick perusal of the Paphos District Museum will provide an idea of the importance of the medical practice within the district. From the doctor's tomb excavated by Michaelides (1984) with the Roman doctor's *instrumentarium*, to the Hellenistic period anatomically shaped 'hot water bottles' discovered within the archaeological park (unpublished) and the statues to Askleipios, the Paphos area is rich in medical history from antiquity.

In regards to medicine in prehistory, there does not seem to be much evidence for explicit medical treatment, as there is no evidence of trephination or other surgical investigations which would leave obvious physical alterations to the bone. There are however, inferences which can possibly be made through the discovery of the deposit at Kissonerga-*Mosphilia* which has been interpreted as representing a ritual associated with fertility and birth (Bolger 1992, 1994, 1996, 2002, 2003). Bolger suggests one of the uses of these ritual figurines may be as spiritual talismans or somehow linked to the spiritual healing of infertility of women or perhaps protection during childbirth (Bolger 1992:153). The suggestion inherent in this is that there is some form of 'medical' intervention being used to deal with issues of reproduction. She also suggests that perhaps the figurines played a didactic role in emphasizing the importance of sexuality, conception, procreation and motherhood (Bolger 1992: 153). This implies that there was perhaps some transmission of information regarding the health issues of childbirth. Lunt and Domurad suggest that there were high infant mortality rates at Lemba-*Lakkous* and Kissonerga-*Mosphilia*. This, coupled with the likelihood of high mortality rates of women in childbirth commonly associated with pre-industrial societies, could induce a community to take a medico-ritual approach to fertility and birth (Lunt 1985: 246; Bolger 1992:160; O'Donnell 2004: 164).

There is extensive discussion of cranial modification for the Neolithic and Bronze Age (i.e. Angel 1953; Hjortsjö 1947; Lorentz 2001, 2003, 2006, 2008b, c; Schulte-Campbell 1981; Schwartz 1974, 1976; von Fürst 1933). While not medical in nature, the modification of an infants' cranium indicates a certain comprehension of growth and physical development. It can possibly be inferred from this that there was some understanding of the human body which would inevitably lead to a form of care for individuals requiring it. There is evidence of disease through the palaeopathological studies conducted on the human remains within site reports. Illness and injury are as much a part of the human experience as birth and death, although the level of treatment is unclear in prehistory. It must be noted that some of the injuries or pathologies recorded within this study and others would have been debilitating to the individual, yet they survived, at least long enough for a lesion to form. This indicates that there could have been some system of care within the populations which sustained those who could not provide for themselves.

1.9 Conclusion

As there are many different factors which can influence the pathologies observed on archaeological skeletal remains, this chapter has aimed at discussing the environment in which the individuals represented by the skeletal remains studied would have lived. A synopsis of the history of physical anthropology on Cyprus was presented along with the current descriptions of palaeopathology, bioarchaeology and medical history to provide a theoretical background for which the research in this thesis took place. The island of Cyprus has a rich prehistory and is suitably placed and investigated to provide important information about the evolution of health and disease processes in the Eastern Mediterranean. The Middle Chalcolithic period represents the pinnacle of the Chalcolithic cultural phase, with the beginning of a complex, stratified society as evidenced by the material culture. By placing the archaeological context within the environmental and climatic setting, a greater understanding of the possible aetiologies of the disease processes present is attained. Just as humans impact their environment, many aspects of climate and environment will impact on the lifeways and consequently the pathologies which may be present within a community. Human remains are gradually beginning to take their place within the repertoire of useful material for answering problem-oriented archaeological questions on Cyprus, stemming from a long tradition of physical anthropology on the island. This research uses a bioarchaeological approach, by using biological data to answer questions about the Chalcolithic population regarding health and disease which allows for interpretations regarding lifeways of the people from this period based on the prevalence and patterns of pathological lesions. Therefore this chapter has presented the contextual background and setting for the individuals represented by the skeletal remains being analysed. The sites of Souskiou-*Laona*, Kissonerga-*Mosphilia* and Lemba-*Lakkous* provide the largest and most archaeologically contextualized sites from the Middle Chalcolithic period and thus are good choices for this study on the human remains from this period. Chapter 2 will describe the skeletal samples analysed for this study and the methods utilised.

Chapter 2: Materials and Methods

Chapter One presented the general background information on various factors which can have an influence on the expression of pathologies on the skeleton and outlined the current state of palaeopathological research in Cyprus. This chapter will present the skeletal remains under study and the basic contextual information about their archaeological setting followed by the methods used for the analysis of pathologies on the skeletal remains. In this study human skeletal remains provide the basic source material which was examined, recorded and analysed. The skeletal remains are derived from three archaeological sites, Souskiou-*Laona* (c.3000 BC), Lemba-*Lakkous* (c.3500-2400 BC) and Kissonerga-*Mosphilia* (late 7th millennium-2400 BC) which are described below. Following a description of the skeletal material, the methods of examination, recording and analysis are provided. This includes a description of the steps taken and reasoning for why those particular steps were followed, based on the issues and problems encountered when dealing with the highly fragmentary, often commingled skeletal material. Using examples of previous palaeopathological studies, the methods used in this study are discussed along with the changes required due to the specific problems associated with these skeletal samples.

2.1 Materials

The human remains from three Chalcolithic sites in the southwest of Cyprus are analysed for this study. Lemba-*Lakkous* and Kissonerga-*Mosphilia* are settlement sites, while Souskiou-*Laona* Operation C is a cemetery site. All three sites are located in the Paphos District and are relatively contemporaneous with each other[4], with the skeletal remains dating primarily to the Middle Chalcolithic period (c.3400-2900 BC). There are several reasons why these three sites were selected for comparison. First of all, they represent the bulk of the human skeletal remains from the Chalcolithic period. Secondly, as preservation of the skeletal material is a problem on Cyprus, these three sites represent some of the best preserved skeletons on the island. Finally, Souskiou-*Laona* Operation C represents the most completely excavated prehistoric

[4] Kissonerga-*Mosphilia* has a long period of habitation, however, the majority of the graves (and hence skeletal material) date to the Middle-Late Chalcolithic periods, primarily Kissonerga-*Mosphilia* period 3a, 3b and 4 (see Appendix B for the dates).

cemetery in Cyprus providing a unique opportunity to study a large relatively complete skeletal sample. For the purpose of this study, based on the chronological synchronicity and similar grave inclusions (i.e. the picrolite figurines) the settlement and cemetery skeletal groups are taken to be regionally connected and comparable through health status. The regional proximity and chronological synchronicity encourages comparison across the three sites. However, it also limits how representative these selected skeletal series' are of the whole Chalcolithic population in Cyprus. Other than variations in geography, there seems to be a level of homogeneity of culture across the island at this time, despite the apparent insularity of each community (Peltenburg 1991a: 107). Until the skeletal remains from other Chalcolithic sites in other regions of the island are examined, the pathologies observed on the skeletal samples within this study cannot necessarily be seen to represent the island-wide Chalcolithic population. However, the results of the analysis within this thesis represent the most comprehensive pathological analysis for the Chalcolithic populations to date. In regards to sampling strategy of the skeletal material for this study, all the excavated remains from the defined graves from the settlement sites, as per the publications (Peltenburg *et al.* 1985, 1998) which could be located within the Paphos District Museum stores were included within the analysis. The skeletal sample studied from Souskiou-*Laona* is derived from tombs with secure burial contexts in regards to looting (see below section on Souskiou-*Laona* for more information). Details of each site follow, along with some information on the burials and previous work on the human remains from the published sites of Lemba-*Lakkous* and Kissonerga-*Mosphilia*.

2.1.1 Souskiou-Laona

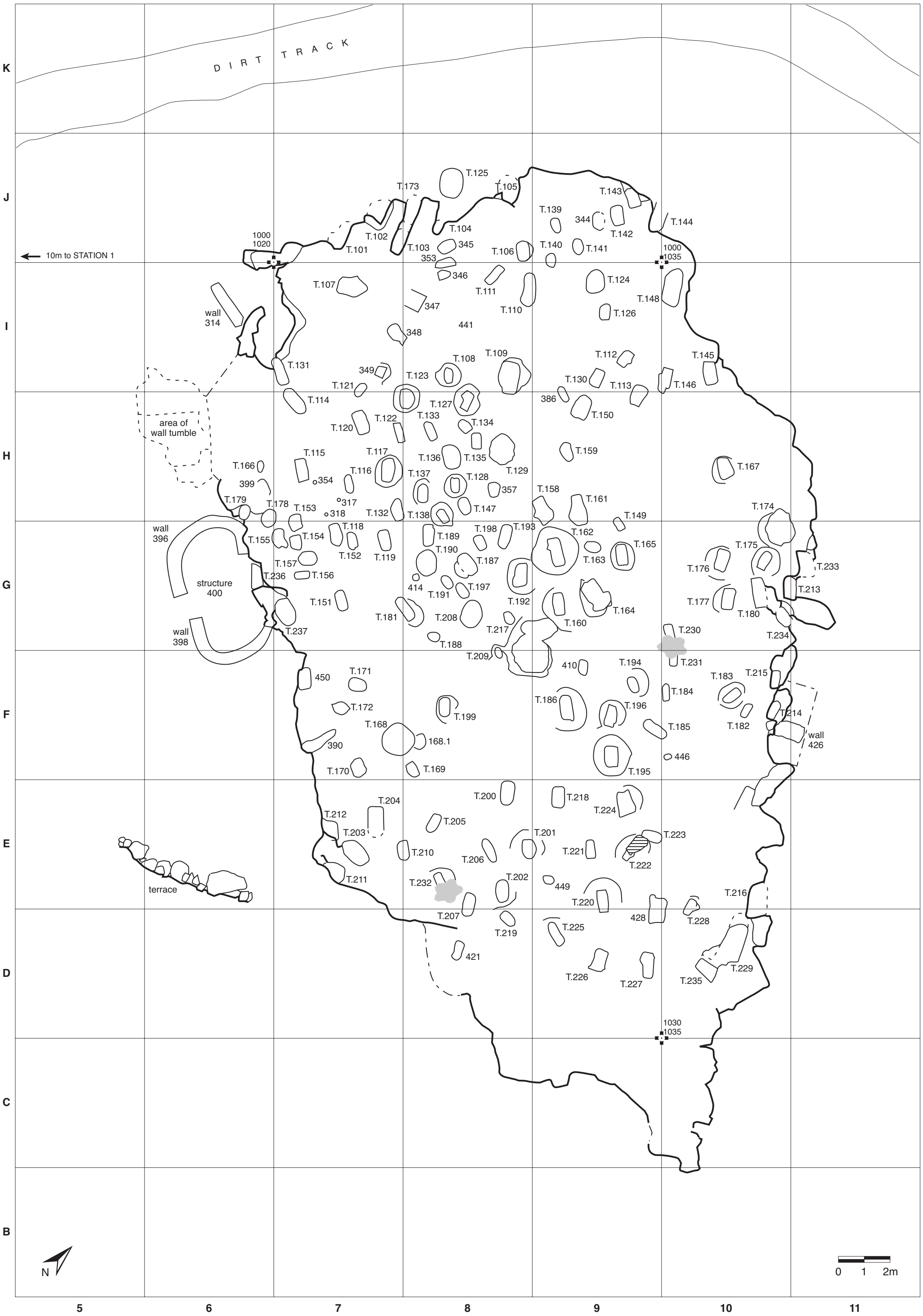
The human remains derived from Souskiou-*Laona* Operation C compose the largest sample within this study and the primary site of comparison for the two settlement site samples. The Souskiou-*Laona* cemetery (Operation C) is located on a ridge between the Vathyrkakas ravine and the Dhiarizos River Valley. It is 350 m away from the Souskiou-*Laona* settlement (Operation A), and just across the ravine from the other excavated Chalcolithic cemetery of Souskiou-*Vathyrkakas*. Souskiou-*Laona* cemetery (Operation C) sits on a spur with a commanding view of the west over the Dhiarizos Valley and east to the Troodos Mountains (Crewe *et al.* 2005: 44). The outcrop which contains the cemetery rises above the ridge one to three metres and is approximately

25 m east-west and 40 m north-south and is composed of a mix of hard limestone (*kafkalla*) and softer decomposed limestone (*havara*) (Crewe *et al.* 2005: 44). From this point on, within this thesis, the name Souskiou-*Laona* refers solely to the cemetery Operation C excavation which was conducted by the University of Edinburgh (2000-2006).

This cemetery site represents the first Chalcolithic cemetery excavation that was completed with consistent and modern anthropological techniques that have allowed for complete and comprehensive recording. Souskiou-*Laona* was first noted by Maier in 1974 and was assumed to be completely looted (Crewe *et al.* 2005: 43). Thus, the initial intention of the excavation was to study tomb types and remove whatever remains the looters had missed. However, when un-looted tombs were uncovered the research strategy changed to include anthropological and bioarchaeological studies of the human remains (Crewe *et al.* 2005: 43). Because the thoroughness of the looting of the tombs is variable across the cemetery, a series of four tomb status types was established based on looting status of the artefacts and skeletal material (Crewe *et al.* 2005: 47). The four tomb status types are: (1) looted (tombs which had been opened and emptied or partially emptied); (2) partially looted/disturbed burial (tombs with a mixed upper fill and localised disturbance of the burial layer with some intact remains); (3) partially looted/intact burial (tombs which have disturbed, mixed upper fills but undisturbed burial layer); (4) intact (tombs which are undisturbed and unlooted) (Crewe *et al.* 2005: 47-48).

The burial facilities and human remains recovered from the cemetery date to ca. 3000 BC. A total of 237 features have been excavated including over 150 burial facilities, each containing multiple individuals in a variety of burial contexts (i.e. articulated and commingled 'bonestack' remains) and states of preservation (Crewe *et al.* 2005 – Figure 2.1). The site of Souskiou-*Laona* is still largely unpublished. There are some initial reports by the directors, preliminary papers on the contextual evidence and some preliminary results of the skeletal analysis from the site which have been published recently (Crewe *et al.* 2002, 2005; Lorentz *in press a, forthcoming a, forthcoming b*). Full results of skeletal analyses will be published in due course (Lorentz *in preparation a*).

Figure 2.1: Site plan of Souskiou-*Laona* (Crewe *et al.* 2005: 47)



The question of ‘who’ is buried within Souskiou-*Laona* cemetery is still under consideration by the excavators. It was initially assumed that the adjacent settlement was not large enough to account for the large mortuary population recovered from the surrounding cemeteries and was thought to be a regional burial centre. However, recent and continuing excavations at the Souskiou-*Laona* settlement have uncovered a larger habitation area than was initially suspected and in a reassessment, the excavators believe that the settlement is possibly large enough to account for the large mortuary population (Peltenburg pers. comm.). Therefore, the Middle Chalcolithic population derived from the cemetery may be treated as a discrete skeletal sample in the analysis of pathologies.

The skeletal remains from Souskiou-*Laona* are stored at the Lemba Archaeological Research Centre, Paphos District, Cyprus and it was here that the examination of the human remains took place. Permission to examine the human remains for the purpose of this doctoral thesis was graciously granted by the director of the Lemba Archaeological Research Project, E.J. Peltenburg, under whose auspices all the excavations took place and K.O. Lorentz, the director of the human remains excavation and analyses. A total of 27 burial contexts were examined containing a minimum of 125 individuals in a variety of states of preservation and contexts. The human remains from Souskiou-*Laona* examined for this thesis reflect a sample of the total mortuary population derived from the cemetery, and while this sub-sample is expected to reasonably reflect the overall mortuary population from the site, this can only be verified once the overall study has been completed (Lorentz pers. comm.). The selection of the skeletal sample from Souskiou-*Laona* for this thesis was based on the extent of the looting action observed on the burial layer (i.e. the layer containing the human remains deposition) within the tombs to ensure the best contextual situation for the analysis. As well, given the size of the skeletal collection, the ongoing nature of the post-excavation analysis and the time constraints of a three-year doctoral thesis, it was necessary to select a sample of the overall skeletal population within the cemetery. This sample is composed of the remains from the most secure tomb contexts (in regards to limited looting activities) and does not included the human remains from the upper fills of the tombs for the most part, as these are not always contextually secure. A tomb was included within this study if the burial layer was assessed as intact by the excavators[5] (see Crewe *et al.* 2005 for more details regarding tomb status). The minimum number of individuals studied from Souskiou-

[5] The only exception to this is Tomb 228 which was looted while under excavation. The skeletal material from this tomb was recorded as commingled and included within the study as there was no mixing of the skeletal material from this tomb context with other adjacent tomb contexts.

Laona for this doctoral thesis is 125, of which 31.7% are under the age of 21 years at death and 68.3% are adults (skeletally mature with an estimated age over 21 years) of which 53.6% are adult females, 27.4% are adult males and 19.0% are adults with no sex assessment. Appendices D and E contain discrete skeleton and tomb descriptions, respectively.

2.1.2 Lemba-Lakkous

Lemba-*Lakkous* is located within the village boundaries of the modern village of Lemba, at the northern end of the Ktima Lowlands in the Paphos District, approximately 4 km from Paphos (Peltenburg *et al.* 1985: 4-5). The site sits on the southwest/seaward facing slope overlooking a narrow fertile coastal strip up to ca. 2.5 km wide, at an elevation of 56-66 m above sea level (Peltenburg *et al.* 1985: 5). Lemba-*Lakkous* was first recorded in 1975 in an archaeological survey of the Paphos District (Hadjisavvas 1977: 224). The settlement covers an area of approximately 3 hectares. It was excavated between 1976 and 1983 in two areas about 100 m apart by the University of Edinburgh and the Lemba Archaeological Research Project (Peltenburg *et al.* 1985: 9 – Figures 2.2 and 2.3).

Area I of Lemba-*Lakkous* dates to the early Middle Chalcolithic (c.3400-3200 BC), while Area II contains structures from the later Middle Chalcolithic (c.3200-2900 BC) overlain with structures from the Late Chalcolithic period (c. 2700-2400) (Thomas 2005: 39). Lemba-*Lakkous* has been comprehensively studied in terms of faunal, ground stone and chipped stone, mollusc, ceramic and structural analyses (Peltenburg *et al.* 1985). The most extensive research is based on prehistoric buildings with the construction of an experimental village next to the excavated area (Figure 2.4). There has been much analysis and discussion regarding the buildings of the Lemba-*Lakkous* village which has provided a clearer image of the living conditions of the inhabitants of the village in the Chalcolithic period (Peltenburg *et al.* 1985: 19-36, 107-114; Croft, 1999; Thomas 2005).

Figure 2.2: Lemba-*Lakkous* Area I Site Plan with graves numbered (Peltenburg *et al.* 1985: 10)

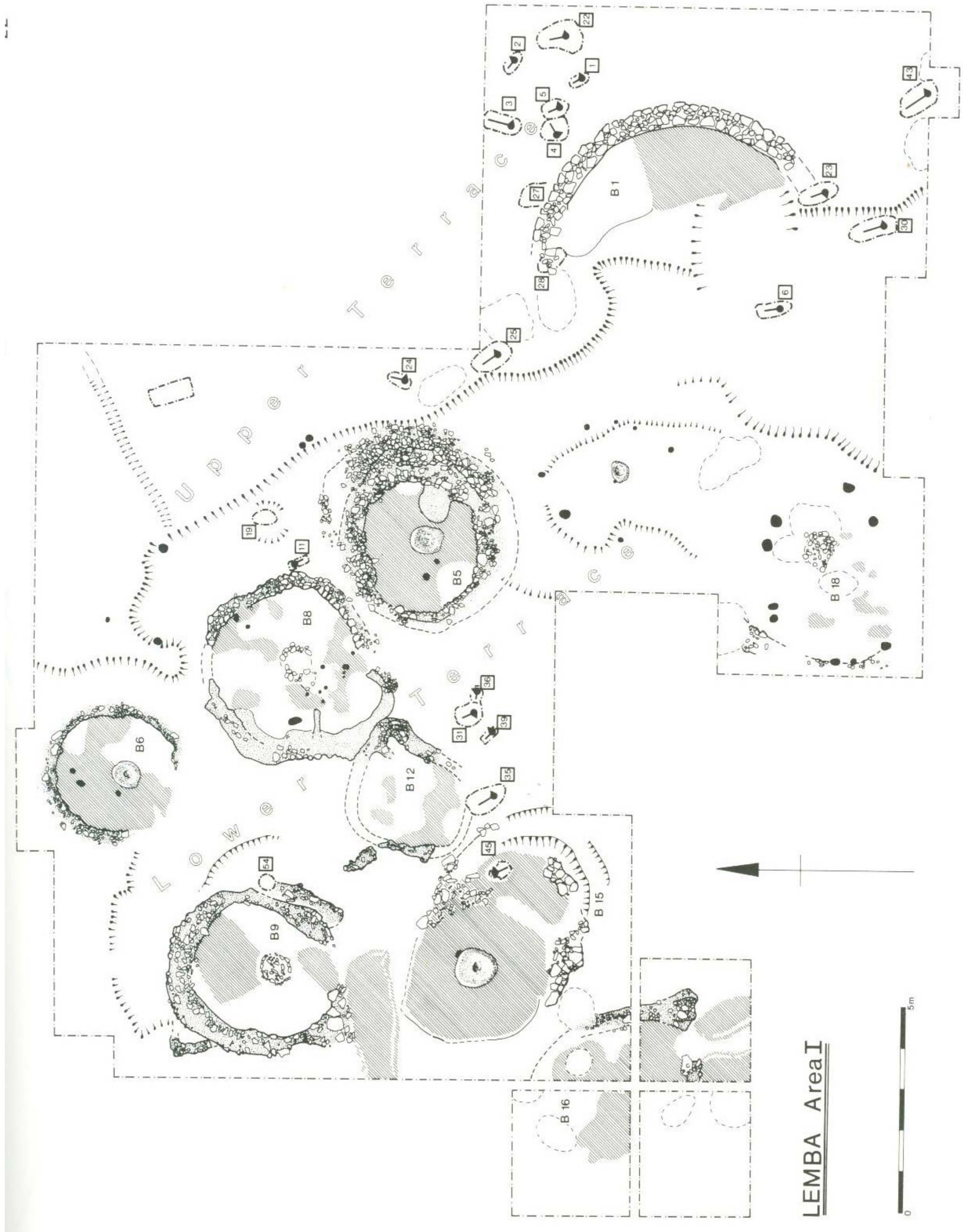


Figure 2.3: Lemba-*Lakkous* Area II Site Plan with graves numbered (Peltenburg *et al.* 1985: 22)

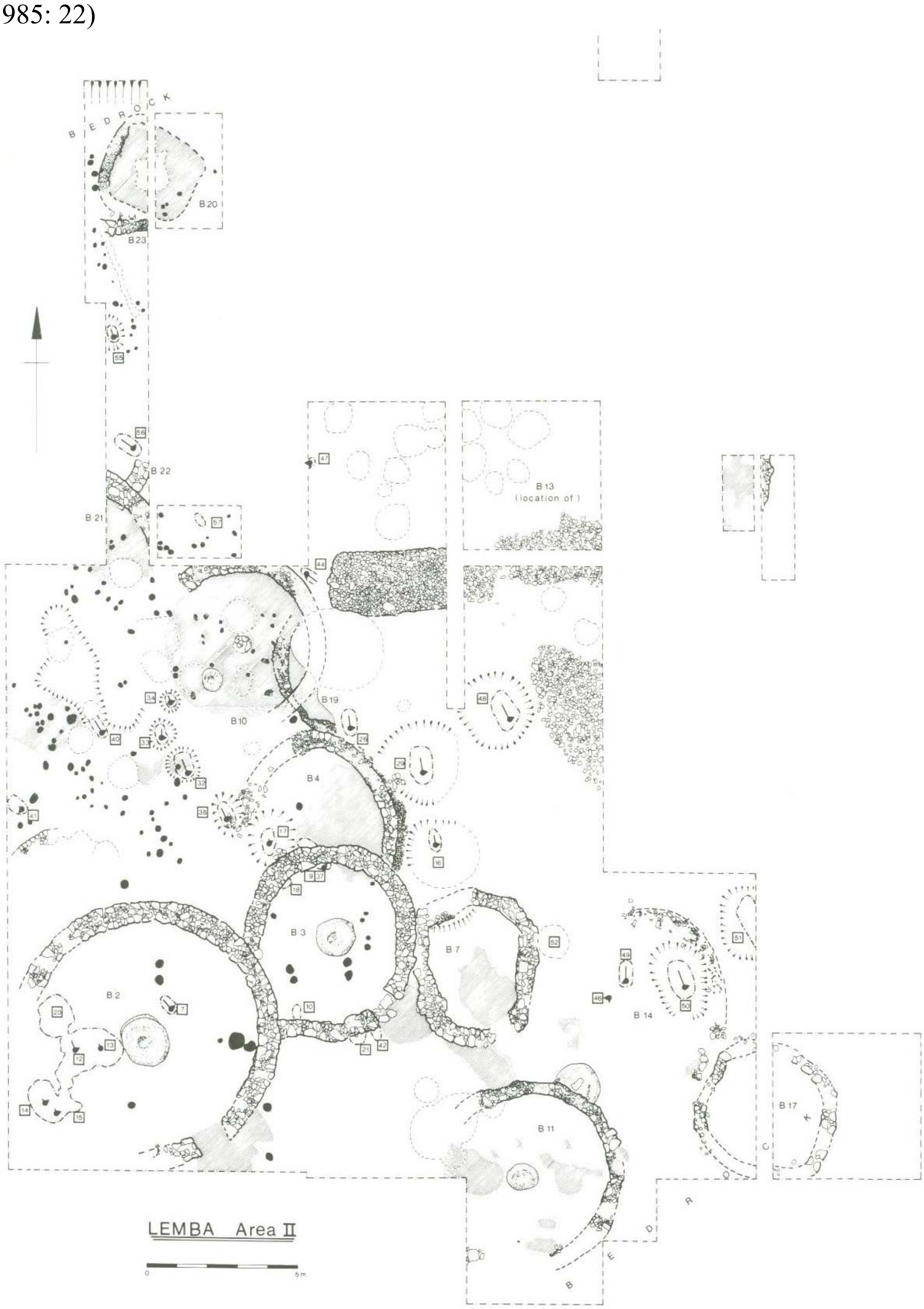


Figure 2.4: Lemba-*Lakkous* reconstructed Chalcolithic village

The burials at Lemba-*Lakkous* have been studied by Niklasson who examined the different burial practices in prehistoric Cyprus (1991). She focuses on the changes in burial practice and grave structure from the Neolithic to the Early Bronze Age. According to Niklasson, there were 56 graves excavated containing the remains of at least 55-57 individuals, and another 14 pits which may represent further graves but they did not contain human remains (1991: 124, 134, 177). Apart from one grave (grave 45 of a child) the majority of the graves are extramural (without the walls of the buildings of a particular period) and it is believed that early graves were grouped together in open spaces (Niklasson 1991: 177). Most of the burials at Lemba-*Lakkous* appear to be primary. However, there are about 15 which may reflect secondary burial, with at least ten representing partial interments of infants or children. It must be noted that preservation may also play a role in the reflection of the interments appearing partial. According to Niklasson (1991: 186-187), the excavators have interpreted several pits as graves which did not contain any human remains, missing skeletal elements from articulated individuals and the inclusion of extra human skeletal elements in otherwise undisturbed burials as indications of the deliberate reopening of graves for the removal of skeletal parts and specifically that there is 'emphasis' on the skull. The current analysis of the human remains from Lemba-*Lakkous* could be consistent with these interpretations as the skeletons examined are typically incomplete and in some cases disarticulated. However, the absence of skeletal elements does not exclusively mean that elements were removed in prehistory as aspects of bone diagenesis, taphonomic processes and excavation methods could also affect the presence or absence of skeletal elements within the graves, particularly since Niklasson emphasizes the association of missing elements with child burials which do not tend to survive as well (Niklasson 1991: 187 and bone preservation, Bello *et al.* 2006). In regards to the burial contexts where the skulls are found independently of the postcranial skeletal material and vice versa within this current analysis, it is feasible that it reflects post-mortem movement of the cranial material. Overall, it is possible that there was some post-mortem manipulation of the human skeletal remains revolving around the skulls, but further suggestions of selective movement of postcranial bones cannot be substantiated based on Niklasson's suggestions of missing elements or the inventories of the skeletal remains from this study.

The dentitions from Lemba-*Lakkous* were examined by Lunt in an analysis which is primarily descriptive with a basic demographic profile provided (Lunt 1985: 54-58, 150-153). She provides age and sex where possible and discusses the pathologies which are present. According to Lunt, the minimum number of individuals is 52. Of these, 65.4% have been assessed as sub-adults (Lunt 1985: 246). The pathologies Lunt observed are: dental caries (which were observed in the teeth of a couple of children and 6.1% of the adult and adolescent population), an apical abscess on one individual, five cases of ante-mortem tooth loss, two possible cases of linear enamel hypoplasias, and a few cases of congenitally absent teeth and some morphological anomalies (Lunt 1985: 248). She lists one instance of bone pathology in Grave 17, an area of inflammation and fistula in the palate of a young child (Lunt 1985:249). Overall, Lunt states that 'the poor state of preservation of the alveolar bone in the adults precludes any attempt to assess the general periodontal condition in Lemba-*Lakkous* population or to evaluate the role of periodontal disease in tooth loss during life' (Lunt 1985: 248).

The human remains which were examined from Lemba-*Lakkous* for this study, were those which could be accessed at the Paphos District Museum. Other than the dentition which is discussed above, there was a brief preliminary report on the human remains from Lemba-*Lakkous* by Downs (1982). Therefore, these remains are predominantly unpublished. They were made available for study by the gracious consent of the excavation director E.J. Peltenburg with permission granted by a former Director of the Department of Antiquities, P. Flourentzos.

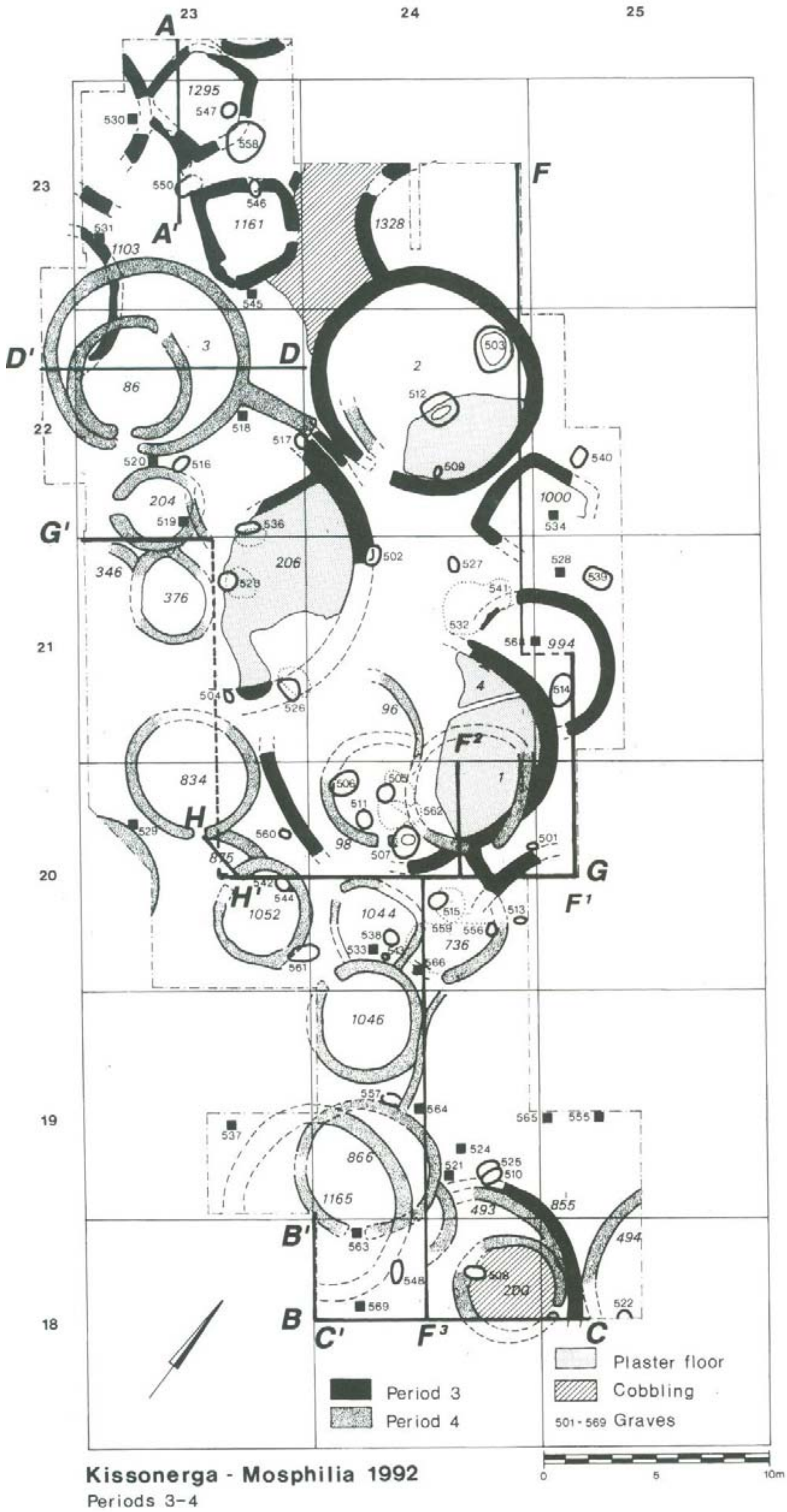
The skeletal material from 48 graves was examined, 18 from Area I and 30 from Area II. Attempts were made to access all the skeletal material from the site. However, of the published grave numbers, the skeletal material from Graves 1, 55 and 57 were not located within the museum storage and there are questions regarding Grave 23 which is supposed to be currently on display at the Museum. A minimum of 58 individuals were examined from Lemba-*Lakkous* for this thesis, of which 72.4% are under the age of 21 years at death and 27.6% are adults (skeletally mature with an estimated age over 21 years at death) of which 66.7% are adult females, 20.0% are adult males and 13.3% are adults with no sex assessment. As indicated by the numbers provided in the paragraph above, the number of individuals and the observation of dental pathology within this study differ from that determined by Lunt. A grave by grave discussion, including the differences in observations can be found in Appendix F and Appendix G. Further demographic information and observations on the pathologies follows in Chapter Three.

2.1.3 Kissonerga-Mosphilia

Kissonerga-*Mosphilia* is located 6 km north of Paphos in the Ktima Lowlands, on the coastal plain below the modern village of Kissonerga (Peltenburg *et al.* 1998: 1). It is only about 500 m from the present day coastline and is adjacent to the Skotinis stream which according to molluscan evidence may have been perennial in the past (Peltenburg *et al.* 1998: 1). The site has been occupied and deserted a number of times since the Aceramic Neolithic period and has many levels of evidence of habitation yet according to Peltenburg, there is no obvious indication of why this particular site was so exceptional in terms of prosperity, size and longevity (Peltenburg *et al.* 1998:1 – Figure 2.5).

Kissonerga-*Mosphilia* was first reported by Megaw when he accessed material from it in the Cyprus Museum (1952: 113). The site was again reported in the 1975 survey of the Paphos District (Hadjisavvas 1977: 224) and excavated between 1979 and 1992 by the University of Edinburgh under the Lemba Archaeological Research Project. The site is considered a major Chalcolithic settlement site, and is much larger than

Figure 2.5: Kissonerga-*Mosphilia* Site Plan with graves numbered (Peltenburg *et al.* 1998: 17).



Lemba-*Lakkous* and closer in size to Erimi, at about 12 hectares (Peltenburg *et al.* 1998: 3; Peltenburg 1991: 18). This site has attracted scholarly attention because of a possible ritual building and ritual artefacts which have been recovered depicting female fertility figurines and images of childbirth (Bolger 1992; Croft 1999: 51-56; Peltenburg 1991; Peltenburg *et al.* 1991). Many of these studies discuss women's role in the society and the concept of matriarchy and female fertility worship (Peltenburg 2002; Bolger 2003).

The graves at Kissonerga-*Mosphilia* were partially studied by Niklasson who states that there were 22 pit graves, five chamber tombs, a few burials without pit association and two possible child pot burials, with a total of 40-45 individuals found at Kissonerga-*Mosphilia* (Niklasson 1991: 178). Secondary burials and disturbance of burials seems relatively common at Kissonerga-*Mosphilia* based on the same indications as Lemba-*Lakkous*, including empty pits which have been interpreted as graves, missing skeletal elements and particularly readjustment of the skull based on several graves which included only cranial elements or only postcranial elements (Niklasson 1991: 188-189). As with the Lemba-*Lakkous* skeletal material, it is not possible from the skeletal analysis to determine the extent of the post-mortem manipulation of the skeletal material as a number of factors can influence the recovery of the skeleton including taphonomy and excavation. That a few graves contained only a skull seems to suggest that the skull was removed from the body and buried independently. This recalls the treatment of a skull from the Neolithic well 133 at nearby Kissonerga-*Mylouthkia*. In this case, there is a cranium, which displays occipital deformation, and a first cervical vertebra found in proximity to each other with no further skeletal remains present suggesting that the skull was secondarily interred (Fox *et al.* 2003). Because of the lengthy occupation of the site, from the Neolithic period to the Early Bronze Age, it is possible to chronologically observe changes in mortuary features, from fairly consistent use of the pit grave in the Middle Chalcolithic (c.3400-2900 BC) to a more diverse range of grave types, including the chambered tomb, pot burial and scoop graves, in the later Middle Chalcolithic and Late Chalcolithic period (c.3200-2400 BC) (Croft 1999: 49; Lunt *et al*. 1998: 70-72; Peltenburg 1991b: 21-30).

Peltenburg *et al.*'s final publication of the site states that there are 73 graves within it which predominantly date to the Late Chalcolithic period (Kissonerga-*Mosphilia* period 4) (Lunt *et al.* 1998: 65). The dentition was studied by Lunt who states that there were 77 individuals from interments or 89 including identifiable interments outside facilities. A further 107 records of fragmentary human bone were recovered from general habitation deposits (Lunt *et al.* 1998: 65). Lunt provides a basic demographic profile based on the dentition and cranial elements. Sub-adults (those under the age of 21 years at death) account for 72.0% of the population. Her palaeopathological analysis observes dental caries on 1.8% (n=10) of the permanent teeth and 0.7% (n=2) of the deciduous teeth, abscesses were noted on at least 2.3% (n=2) of individuals, periodontal disease was noted on at least 2.3% (n=2) of individuals, ante-mortem tooth loss was recorded for 15 individual teeth and enamel hypoplasias were noted on at least 4.9% (n=2) of the individual children observed and 10.0% (n=2) of the adults (Lunt *et al.* 1998: 77-81 – presentation of the pathologies in the publication is in a different format from how it is presented here). Lunt also notes that taurodontism, a variation in the molar root formation, is very high for this population (1998: 76).

The human remains which were examined from Kissonerga-*Mosphilia* were those which could be accessed at the Paphos District Museum. Beyond the dentition which is discussed above, the human bone was partially studied by Domurad (1986; 1987a). Therefore, these remains are predominantly unpublished. They were made available for study by the gracious consent of the excavation director E. Peltenburg with permission granted by the past Director of the Department of Antiquities, P. Flourentzos.

The skeletal material from 62 graves was examined. Attempts were made to access all the skeletal material from the site. However, of the published grave numbers, the material from graves 511, 530, 534, 536, 541 and 558 were not located within the museum storage and interestingly, one unpublished grave was located (Grave 559). A minimum of 80 individuals were examined from Kissonerga-*Mosphilia* for this thesis, of which 68.3% are under the age of 21 years at death and 31.7% are adults (skeletally mature with an estimated age over 21 years at death) of which 52.0% are adult females, 24.0% are adult males and 24.0% are adults with no sex assessment. As indicated by the numbers provided in the paragraph above, the number of individuals and the observation of dental pathology within this study differ from that determined by Lunt. A grave by grave discussion, including the differences in observations can be found in Appendix H and Appendix I. Further demographic information follows in Chapter Three.

2.2 Methods

This is a problem-oriented palaeopathological study, examining whether viable pathological analyses can be done on the poorly preserved human skeletal material from Chalcolithic Cyprus and if so, are there patterns of pathological lesions amongst the different biological groups examined which can be incorporated into evidence of the lifeways and social relationships within this period. In order to consider these questions, samples of human remains from three different Chalcolithic sites in the southwest of Cyprus were examined macroscopically and microscopically for pathological lesions. The observation of different types of pathological lesions on the skeletal remains and the patterns in which they affect different biological groups will possibly illuminate differences in activities performed and diet which in turn can be discussed within the context of previous archaeological interpretations. Within the methods section: the process and practical aspects of the osteological examination are described, followed by the presentation of the methods used for age estimation and sex determination and why these methods were chosen; the issues and solutions associated with studying commingled skeletal material are presented along with the excavation methodology at Souskiou-*Laona*; and bone preservation issues are addressed followed by the different types of pathologies which were assessed and particular problems specific to this study for each. The final two subsections deal with the statistical approach used for the analyses and some of the terminology that are specific to this thesis.

2.2.1 Process and Organization

The analysis of the human remains from the three sites took place in Cyprus at the Lemba Archaeological Research Centre and the Paphos District Museum from 2007 to 2010. The examination of the skeletal remains from all the sites was completed by burial context to prevent inadvertent mixing of the remains. The human remains are stored in crates or museum trays and were still in excavation packaging, therefore requiring organization and in some cases cleaning. Cleaning the bones and teeth involved dry brushing and using a wooden pick to remove the more persistent dirt. If the soil was particularly concreted, water was applied conservatively to remove the soil. Because of the preservation of the skeletal material, full submersion in water would have caused the bones to become 'mushy' and de-stabilize their structure. Water was also used in small amounts on the teeth and on areas where pathology was suspected as this made it easier to see the bone or tooth surfaces. Many skeletal elements required re-packaging and re-labelling once examined in order to ensure safe storage. Aluminium foil, tissue (typically either toilet paper or white tissue paper) and re-sealable plastic bags were all used to repackage bones safely (Figure 2.6).

Figure 2.6: General packaging and cleaning implements for the Souskiou-*Laona* bone

One of the main issues in assessing the skeletal material from the settlement sites was the use of consolidant in excavation and conservation. A number of the bones and teeth were treated with consolidant and in some cases a mesh fabric both of which have adhered dirt to the bone surface. In other cases the bone has been reconstructed improperly. These bones were difficult to assess as the surface was obscured and the morphology was sometimes affected by the poor reconstruction (Figure 2.7). Many of the teeth were treated with consolidant which prohibited the use of water which was used to highlight anomalies on the tooth surface. Overall, the conservation methods employed at Lemba-*Lakkous* and Kissonerga-*Mosphilia* were detrimental to

Figure 2.7: Cranium from Grave 506 at Kissonerga-*Mosphilia* illustrating the use of consolidant

the ability to examine the bones for pathological anomalies. Where there was detrimental conservation on the settlement bones, the surface condition of the bone was recorded as 'obscured' and could not be assessed (see Appendix J for preservation descriptions and below for preservation discussion – this 'obscured' level of surface condition indicates 'concreted' bone surfaces from Souskiou-*Laona*, which indicates only that for this study no assessment of pathology was possible on this particular surface). In regards to conservation of the skeletal material from Souskiou-*Laona*, appropriate, safe storage and conservative reconstruction is suggested.

2.2.2 Minimum Number of Individuals

Almost all of the tombs from Souskiou-*Laona* and some of the graves from both settlement sites contained more than one individual, often commingled. Due to the commingled nature of the burials and that more than one individual may be present within a mortuary feature it was not possible in many cases to attribute a skeletal element to a particular individual. Therefore, each bone and tooth was recorded independently to allow for like elements to be compared for a more precise prevalence of pathological expression on that particular skeletal element. The Minimum Number of Individuals (MNI) is calculated rather than the Most Likely Number of Individuals (MLNI) as suggested by Adams and Krogman (2004, 2008) as the MLNI works better with fairly intact material and the fragmentary nature of the Chalcolithic Cypriot bones would not be conducive to using the MLNI. While the MNI is technically less precise, it allows for a better quantification in regards to fragmentary material.

2.2.3Recording

Recording of the human remains is based on Buikstra and Ubelaker (1994). The use of these standards will allow future researchers to use this data for comparison. Bone identification was aided by Schwartz (1995), White and Folkens (2005) and Baker *et al.* (2005) and tooth identification was aided by Brown (1984). The palaeopathological assessment followed the methodological philosophy Ortner outlines in his paper on 'Theoretical and methodological issues in palaeopathology' (1991), where he states that: 'Application of a good descriptive methodology, including type and location of lesions, to the analysis of archaeological skeletal samples would be a major step in providing descriptive data that would allow independent evaluation of pathological conditions' (Ortner 1991: 8). This suggests that pathological lesions are not diagnosed immediately but rather described in detail to allow for future researchers to discuss possible differential diagnoses.

Each skeletal and dental element was recorded as an individual piece of data. The bone or tooth was identified, sided (where required), the number of fragments were recorded, which section or pieces of the element were present, the level of preservation and the level of fragmentation (see Appendix J). The element was then examined for any abnormalities and pathologies and these were recorded by location on the bone or tooth, type of pathology, the lesion was measured and a general description of the physical attributes of the pathological change was provided. The Lemba Archaeological Research Centre is equipped with a basic bi-focal light microscope, so when a pathological lesion was observed macroscopically on the skeletal material from Souskiou-*Laona*, it was examined in further detail using the microscope. This microscopic observation was not possible for the skeletal material from the settlement sites of Lemba-*Lakkous* and Kissonerga-*Mosphilia* as the Paphos District Museum does not have a microscope available. Elements that could be measured to aid in stature or sex determination were measured using either, an osteometric board, spreading or sliding callipers or a soft measuring tape depending on the aspect which required evaluation. Photographs were taken using a *Sony Cyber-shot* digital camera with 6.0 megapixel resolution. Photographs of almost all pathologies were taken and a variety of photos were taken to record preservation and fragmentation.

2.2.4 Data Collection Methods

'Any identification of a biological quality such as age, sex, stature, or ancestry is, in effect, a probability statement' (White and Folkens 2000: 338).

2.2.4.1 Age Estimation

Dental development, primarily eruption times but including calcification rates where possible (i.e. loose teeth), was the method predominantly used to estimate age at death for those who have yet to reach skeletal maturity, (Moorrees *et al.* 1963; White and Folkens 2000 from Ubelaker 1989). Lunt has noted on the Kissonerga-*Mosphilia* dentition, that there was some variation in the development of the teeth for each individual (1998, 120). She was unable to assess whether the deciduous dentition was persistent or the permanent dentition came earlier than suggested with the developmental standards (Lunt used: Demirjiran and Goldstein 1976; Johanson 1971; Moorrees *et al.* 1963; Schour and Massler 1941). There is some variation in the stages of development of the dentition from Souskiou-*Laona* and Lemba-*Lakkous* as well. Age at death estimation for developmentally immature individuals was also based on general bone size (Baker *et al.* 2005) and epiphyseal closure of the long bones (Krogman and Iscan 1986; McKern and Stewart 1957; Schaefer *et al.* 2009). These methods were used only in conjunction with dental development with individuals and/or to provide a very general age estimate for individual bones where possible.

Estimating the age at death for adults was predominantly based on molar wear using Miles (1963) and Lovejoy (1985) in conjunction, where possible with the other aging methods of the skeleton described below. Using dental wear to assess age at death has its problems as it is difficult to determine the effect of the diet of the individual and the diet's effect on the teeth. Along with this is the inherent softness or hardness of each individual's dentition and their ability to resist the wear and tear of daily life on the teeth (Goodman 1991: 286). So while this method was employed systematically and consistently across all three sample groups, there is the possibility that they do not accurately reflect the true biological age of the individual. In regards to age estimation and palaeopathological analysis, it must be noted that subadult skeletons often do not seem to survive as well as adult skeletons in the same or similar environments which will impact the results of the analysis (for discussion see Bello *et al.* 2006).

Aging by cranial suture closure (Meindl and Lovejoy 1985) does not have the same level of precision for age estimation as methods using the teeth typically and as the preservation of the Chalcolithic material is quite poor, it was only used as a last resort and/or in conjunction with molar wear. Age estimation based on changes to the symphyseal face of the os pubis (Brooks and Suchey 1990; Gilbert and McKern 1973; Katz and Suchey 1986; Todd 1920) and on the auricular surface (Lovejoy *et al.* 1985) was only included when the rare os pubis or complete ilium was preserved. Age at death can also be estimated based on the sternal end of the ribs (Iscan and Loth 1986). However, this method loses some of its precision when the number of the rib is not known and within the Chalcolithic samples, the level of fragmentation and poor preservation makes evaluating the sternal rib ends accurately almost impossible.

Based on skeletal material present each individual was assessed and assigned to one of the age groups based on Buikstra and Ubelaker (1994). These groups are: Prenatal (foetal), infant (neonate -3 years), child (4-12 years), adolescent (12-20 years), young adult (21-35 years), adult (36-50 years) and senior adult (50 years plus). There were also two general groups: general adult (skeletally mature - meaning that the bones observed have fused epiphyses and tooth root apices were complete) and general subadult (skeletally immature - the bones observed do not have fused epiphyses and either deciduous teeth or developing permanent teeth). These are age estimations and may not precisely reflect the exact age at death of the individuals. When utilising these age estimations, it must be remembered that the scales on which they are based are not from a Cypriot prehistoric population and differences amongst populations do exist. That being said, as there is no scale for the Cypriot populations, these were the best references available. Overall, there is a tremendous amount of variation in the timing of skeletal events among individuals, therefore it is important that researchers rely on a number of variables instead of just one skeletal indicator (Lovejoy *et al.* 1985; Samworth and Gowland 2007). While this is the ideal situation, due to the poor preservation levels and the commingled nature of the material, particularly at Souskiou-*Laona*, in many cases only one method of age estimation was possible.

2.2.4.2 Sex Determination

Sex was only assessed for those who were aged as skeletally mature adults since morphological sex determination for subadults is problematic (White and Folkens 2000:365; though there are studies which are working towards creating scales of sexual dimorphism for subadults i.e. Molleson *et al.* 1998; Vlak *et al.* 2008). The skull and the pelvis together provide the most accurate assessment of sex. However, given the commingled nature of much of the skeletal material it was not possible to associate these two body parts together. The bones of the pelvis ‘present the most reliable indicators of sex’, as this is the most sexually dimorphic part of the human skeleton due to the different roles in reproduction between the sexes, with females bearing the children (Buikstra and Ubelaker 1994: 16). Sex determination within this study was predominantly based on cranial and mandibular features (Buikstra and Ubelaker 1994; for reliability assessment see Walrath *et al.* 2004). Where possible the os coxae were used as well, however due to the poor preservation levels of the pelvic material in general, the ability to assess sex and age based on these features was limited (Bass 1995; Brooks and Suchey 1990; Phrenice 1969; White and Folkens 2000). Elements of post cranial bones can provide additional information for the sex determination however these are not reliable indicators on their own (Buikstra and Ubelaker 1994: 69-70 and references therein. However, with methods of assessment continually advancing it may become feasible for sex determination to be reliably based on other skeletal elements (see for example Manolis *et al*. 2009 and Mountrakis *et al* 2010)).

2.2.4.3 Stature Estimation, Racial Affinity and Biological Affinity

While bone measurements were taken when possible, the preservation and fragmentation levels of the long bones did not permit stature estimation very frequently (Trotter 1970). Many of the long bones were missing epiphyses or were too badly fragmented to assess. Metacarpals and metatarsals can also be used to estimate stature (Meadows and Jantz 1992, and Byers *et al* 1989, respectively). However, the commingled nature of the material and the burial programme at Souskiou-*Laona* which often places the feet of the articulated individual on the bonestacks, meant that most of the metatarsals were not able to be associated with a particular individual and therefore no sex determination could be correlated. As well, high fragmentation of the bones limited the number of complete bones available for measurement. Overall, stature is not included within this study, despite its uses in the discussion of childhood health because most of the long bones within the Souskiou-*Laona* tombs could not be associated with a particular individual, making discussion of average heights complicated (Ortner 2003: 41). So while rough estimations of general trends in living height may have been possible, overall this would not have provided a very precise analysis of the average statures within the populations.

The skull is the only part of the skeleton which is widely used to estimate racial affinity (i.e. based on traits attributed to a particular race (see Bass 1995: 86-95)), and is not considered very precise in a macroscopic assessment (White and Folkens 2000: 375). Given the poor preservation levels of the remains and the difficulties in attaining reliable and applicable results, no attempts to assess racial affinity were made with this collection. In regards to determining biological affinity or biodistance (i.e. polygenic skeletal and dental traits which indicate the relatedness or divergence of populations or subgroups within a population (Buikstra *et al.* 1990 in Harper and Fox 2008: 11)), Parras has done some work using non-metric dental traits (2004, 2006) and Harper has approached questions of biological affinity using craniometrics (2003, *in press*). Based on Parras' study, it seems possible that the individuals from the Chalcolithic skeletal populations were descendents of the early migrants to Cyprus from the Levant (Parras 2004: 60).

2.2.4.4 Palaeoepidemiology

Palaeoepidemiology is the study of factors affecting the health and disease processes within an archaeological population (Waldron 2007). The purpose, in regards to this study, is to examine the frequency of a particular pathology within a skeletal assemblage (Waldron 2007:41). In order for this to accurately reflect frequencies within the sample, diagnosis or classification of the pathology is crucial. Accuracy in diagnosis is very low even in clinical cases (Waldron 2007: 48). Therefore, since diagnosis from the human remains relies on the 'gross appearance of any abnormalities present', broad operational definitions are required and a variety of causes considered (Waldron 2007:49). For this study, a process of *differential diagnoses* was used. This means that the pathology was described and all possible explanations were considered to understand the aetiology of the skeletal abnormality (Ortner 2003: 48). A palaeoepidemiological study includes discussion of morbidity and mortality within a population, along with a number of other variables that were not calculated for this study due to preservation issues and the nature of the commingling of some of the skeletal material which limits the representativeness of the information in regards to discrete individuals. Instead, it uses a bioarchaeological framework to discuss the observed pathologies within the context of the archaeological setting.

2.2.5 Commingled Skeletal Material

The tombs of Souskiou-*Laona* included not only articulated skeletons but commingled skeletal material typically including multiple individuals in 'bonestacks'. The term 'bonestack' was first used by Crewe *et al*. (2005) and refers to human skeletal material which has been manipulated post-mortem to form a pile with skulls resting atop carefully stacked long bones and the rest of the skeleton. Dealing with this type of skeletal sample requires a slightly different approach than when examining discrete articulated skeletons. It is not typically possible to re-associate skeletal elements to a particular individual, therefore each skeletal element is treated as a discrete entity. In this study, the minimum number of individuals is determined based on the side and section of particular skeletal elements (for discussion see Adams and Konigsberg 2004). To ensure the most precise number of individuals, the discrete mortuary feature and the section of the bone present was used to establish a minimum number of elements. Issues of commingled skeletal material in archaeological and forensic sites have been dealt with by a number of authors (i.e. Adams and Konigsberg 2004, 2008; Byrd and Adams 2003; Hershkovitz *et al.* 1993; Knüsel and Outram 2004; Outram *et al.* 2005; Ringrose 1995; Ubelaker 2008; Ubelaker and Rife 2008). The highly fragmentary nature, poor surface preservation and commingled context of the bones on Cyprus have required a rather general approach with the identification of the fragments and observations of pathologies on a bone element basis. This reflects a slightly adapted approach to those listed above.

When it comes to the practical application of the recording methods, there needed to be some consideration for various bones or bone groups. Particular bones require specific recording notes. The vertebrae and ribs were often highly fragmentary and could not be reconstructed and were recorded as a group of fragments. There is any number of discrete bones within these groups and as such they are analysed based on burial context. Because of the mixing of bones within the tombs, rarely were the multi-bone parts, like the hands and feet, found in articulation. Siding and numbering of the phalanges can be difficult when the entire hand or foot is not present (see Christensen 2009 for strategies for siding hand phalanges). Therefore, in order to ensure continuity and appropriate confidence, these bones were not associated with a particular digit and were not typically sided.

Within the 255 recorded mandible fragment data records, the majority are described as ‘axial’ (64.9%). This is for two reasons: first is that whenever there was both right and left fragments of the same mandible recovered, it was described as ‘axial’. Secondly because if only the anterior portion of the mandible was observed it was recorded as ‘axial’. The mental trigon is rather robust at its base and it seemed to have a fairly good survival rate (the same cannot be said for the mandibular incisors which are frequently lost post-mortem). In order to avoid double counting of the same mandible the mandible fragment data records were examined within their burial context with general morphology, the type (i.e. side and sections of the mandible present), quantity of fragments present, overall completeness of the fragments and age variations were considered and the mandible fragments which could be associated together were counted as a single entry. If only a few, incomplete fragments were recorded as an independent data record, they were not counted as a discrete mandible if there was another record of a partial mandible and no duplication of bone sections. Therefore, there is a minimum of 192 mandibles recovered from all three sites.

The os coxae are predominately highly fragmentary and incomplete across all three sites. Even when an independent articulated skeleton was examined, in most cases there was incomplete recovery of the two bones, particularly in the cases of subadults where the unfused pieces of the os coxa were lost or broken. Each entry does not represent a single os coxa, but fragments of one. There is a possibility within the commingled material that a single os coxa is counted twice where two different parts of the same bone are recovered, therefore the results do not represent a minimum number of elements observed.

As with the os coxae and vertebrae, the scapulae are highly fragmentary and incomplete which makes it difficult to be certain of the minimum number of elements as there are several fragments which may belong to the same scapula recorded as different data entries. Since pathologies of the scapula tend to be focused on the parts which are associated with the shoulder joint, the glenoid fossa, acromion and coracoid processes, the analysis of pathologies observed on this sample will focus on these areas. While other pathologies may occur involving the spine, blade or border of the scapula, in the majority of cases examined for the Chalcolithic period, these parts were highly fragmentary and it is not possible to assess for pathology. In the case of the commingled material, the spine, blade and border fragments typically could not be assigned a side.

There are a total of 374 carpals recovered from all three sites, representing 8.9% of the expected number of carpals based on the minimum number of individuals. There are a number of possible reasons for this: firstly, the recovery of the carpals at the settlement sites is quite poor, impacted not only by excavation recovery, but also possibly by burial programme with post-mortem movement of the skeletons. Secondly, the general morphology of the carpals, particularly subadult carpals, may not survive the destructive taphonomy on Cyprus. Finally, as there seems to be quite a bit of post-mortem manipulation of the skeletons at all three sites, there could be selective retention of various bones with the living[6].

When discussing pathological expression on the commingled skeletal material, it is impossible to associate the bones to each other and to a discrete individual. Therefore it is impossible to assess if there is bilateral expression of pathology or if adjacent bones in a joint are affected (this does not hold true for the articulated skeletons from all three sties). Despite the difficulties and changes to method required to deal with the commingled material from Souskiou-*Laona* it is essential to include the skeletal material from this site to discuss health and disease in Chalcolithic Cyprus. As noted above, Souskiou-*Laona* is the largest and best excavated skeletal series from the Chalcolithic period and thus provides the best opportunity to discuss the presence of pathologies amongst these skeletal populations. Most of the burials from Lemba-*Lakkous* and Kissonerga-*Mosphilia* are single inhumations where the discrete skeletons can be discussed as independent individuals. Analysis of the discrete skeletons forms a portion of this study, however, if the commingled material was not included from Souskiou-*Laona*, a large portion of the population would be excluded, making the representativeness of the prevalence of pathology within the cemetery incomplete. Considerations when dealing with the commingled skeletal material are important for understanding the precision of the analyses. Without appropriate excavation at Souskiou-*Laona* most of these analyses would not have been possible.

2.2.5.1 Excavation Methodology at Souskiou-*Laona*

The Souskiou-*Laona* cemetery is the first complete Chalcolithic cemetery excavated with modern anthropological techniques. The excavation methods used at Lemba-*Lakkous* and Kissonerga-*Mosphilia* involved the uncovering, planning and removal of the skeletal material, without a specific approach detailed in the publication. It seems that some of the grave fill was put through a flotation sieving rather than the standard

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[6] Further work is currently underway regarding the taphonomic processes affecting the skeletal remains in Cyprus. Studies of the burial programmes at the settlement sites may need to be revisited with the results from this thesis to potentially shed light on the different skeletal elements present and those which are absent.

dry sieving with one by one millimetre mesh. As mentioned above, consolidants were often used in the field during excavation of the skeletal material from the settlement sites. Due to the limited size of the Souskiou-*Laona* cemetery all the tombs in the specific area could be excavated and a relatively complete sample obtained, unlike at the settlement sites where excavation of the graves was determined by the excavation plan regarding the settlement structures. In order to gain an idea of burial practice in this period, which is highly variable (see Peltenburg *et al.* 1998: 65-72 and Niklasson 1991), detailed excavation provides a much clearer idea of the programme of deposition.

The excavations at Souskiou-*Laona* were conducted using the French methodological system called *l'anthropologie de terrain* or *archaeothanatology* (Duday 2008: 6). This is a cross-disciplinary approach to understanding burial practice and mortuary ritual, using biological knowledge of how the body decomposes to reconstruct body position and other aspects of mortuary practice. As Duday states, it is a 'methodological choice… of placing the deceased at the centre of interest in the tomb' (2009: 6) and trying to reconstruct the 'corpse taphonomy' (Duday 2009: 13). Understanding the original deposition depends on a number of interactions, including: obtaining an idea of intentional actions in deposition and those unintentional processes which results in a particular feature of the burial and gaining an understanding how the body decomposes, in order to know where the voids in the body will occur and the possible reactions of the bones when these voids are created (Duday 2009: 19-33). In order to be able to make inferences regarding burial practice based on burial position and program there must be exemplary recording and some ability to recognize the bones of the human body.

The excavation and recording methods for the human skeletal remains employed at Souskiou-*Laona* will be discussed in further detail in future publications (Lorentz *in preparation a*). In terms of burial deposition within the tombs, the number of individuals within varies, however there seems to be a rather consistent system in place[7]. It would seem that in many of the tombs there is one to three articulated individuals within. Where there is more than one articulated individual, it is possible

[7] The comments within this study are based on the author's examination of the bones and a preliminary look at the tomb plans, a more detailed and precise description and understanding is in preparation by K.O. Lorentz and previous discussion can be found in Crewe *et al.* 2005: 60.

that they were interred at relatively the same time as intact individuals, based on the relational position of the skeletons. Many of the tombs were re-used. The previous occupants, which were in various stages of disarticulation, were 'reduced' to the sides of the tomb, with the long bones stacked and the cranium placed on top of this stack ('reduction' implies the collection of the remains to one side of the structure with the purpose of providing the necessary space for the next individual (Duday 2009: 73)). The feet of the newly deposited, 'articulated' individual were often placed on top the sloping sides of this bonestack (Crewe *et al.* 2005: 60; Figure 2.8). The bonestacks contain between one to nine disarticulated individuals. It is not possible in most cases to determine the relative chronology of deposition of the bonestack material and articulated skeletons, there are some cases of articulated skeletal elements representing a body part within the bonestacks which may be useful in future studies to determine the relative time-frame for the different deposits of human remains (Lorentz 2010; *in preparation a*). A study for an undergraduate dissertation has demonstrated that the minimum number of individuals indicated by the small bones within the tombs is consistent with minimum number of individuals derived from the larger long bones, which indicates that the bonestack material is most likely not a secondary deposit (i.e. it hasn't been brought from another location after decomposition had taken place – but it does represent secondary burial practice) (Farnaby 2008; Lorentz *in press a*)[8].

Figure 2.8: Souskiou-*Laona* Tomb 108 (Crewe *et al.* 2005:62)

[8] Not all tombs at Souskiou-*Laona* conform to this burial program. Most notably, Tombs 168, 125 and 159 do not include articulated individuals at all, rather just large bonestacks. At least two tombs contained no bonestack material, with two articulated individuals (Tombs 108 and 189). As mentioned above, this is simply preliminary observations and further discussion will be published by K.O. Lorentz in due course.

2.2.6 Assessing Preservation and Mitigating for Poor Preservation

Preservation of archaeological human remains is generally quite poor across the island, as evidenced by the osteological reports in archaeological site reports which lament the inability to examine the remains using the standard anthropological methods of assessment due to poor preservation (i.e. Agelarakis 1997: 11; Domurad 1986: 166; Lunt 1994: 120). Because of the limitations of analysis created by the poor preservation, it has until recently been held that there is little academic value in human remains on Cyprus. Previous studies have shown that it is possible to gather important information from fragmentary and poorly preserved material (i.e. Blau 2001; Fox Leonard 1997; Nagar *et al.* 1999). Recording during excavation, and curation protocols in museums have, until recently received limited attention. Preliminary studies of the human remains at Souskiou-*Laona* indicated that preservation was going to be an issue. Therefore, a set of descriptive scales of was created to not only describe the state of the bone surface, but also the level of fragmentation of the particular bone element. These scales were created specifically for this study and highlight the importance in understanding all aspects of a skeletal sample to facilitate a better understanding of quantified results (See Appendix J and Figures 2.9 and 2.10).

In general the human remains from Souskiou-*Laona* appear chalky and eroded. This is generally caused by environmental processes acting on the skeletal elements. In this case, the basic (or alkali) nature of the soil seems to have had a negative impact on the preservation of the tooth surface (Lunt 1994:120) and by correlation the bone surfaces as well. However, these processes of bone diagenesis have yet to be systematically studied and hopefully future work will examine the microstructural changes caused by the taphonomic processes. The human remains from Kissonerga-*Mosphilia* and Lemba-*Lakkous* have an eroded and flaky surface appearance, the chalkiness which is very prominent at Souskiou-*Laona* is not observed here. The surface preservation of the human remains from Kissonerga-*Mosphilia* is slightly better than that of Lemba-*Lakkous*. However, as mentioned above, one of the main problems in assessing the remains from both settlement sites was the use of consolidant in the field (see above Figure 2.7).

Figure 2.9: Surface Preservation Levels – Top line: acromion = 0 no surface damage; cervical vertebrae = 1 obscured surfaces; patella = 2 fair preservation; and bottom line: cranial fragment = 3 moderate preservation; proximal hand phalanx = 4 poor preservation; vertebral body = 5 very poor preservation. Please note that the pictures are not to scale and are there to provide an example of the different surface conditions of the bones.

Figure 2.10: Fragmentation Levels – Top line: cervical vertebra = 0 intact; mandible = 1 broken in sizable pieces; and bottom line: mandible = 2 fragmentary; lumbar vertebra = 3 very fragmentary; tibia = 4 no recognizable fragments. Please note that these pictures are not to scale and are intended to provide an example of the different fragmentation levels.

Based on this study, it seems necessary to advocate a conservative use of consolidant in the field and then it should only be applied by a trained physical anthropologist or conservator where deemed absolutely necessary and it should be completely reversible.

In regards to the impact of bone diagenesis on the Chalcolithic Cypriot bones when attempting to assess for pathologies, the nature of pathological expression must be considered. There are two main ways that osseous material can react to a pathological assault. Either bone will form or bone will disappear (Waldron 2009:21). Bone resorption is the more difficult of the two reactions to determine given the state of preservation of the Chalcolithic skeletal material. This is because the taphonomic processes which act on the bone tend to degrade the bone and remove elements, making it flaky and less complete. Therefore, describing the state of the bone or tooth surface becomes important to understanding the results of the quantitative analysis. It must, however, be kept in mind that the estimation of surface condition is a highly subjective endeavour, plagued by the usual problems of inter-observer error. Until a consistent method of observation can be established, it is important to attempt to use illustrative, descriptive components. While skeletal surface preservation is not ideal within these Chalcolithic skeletal series, with specific methods and appropriately framed research questions there is potential for poorly preserved material to add to our understanding of past populations (Gamble and Lorentz *forthcoming a*).

The preservation issues on Cyprus require an analysis of the types of pathological lesions which can be assessed and those which cannot on the skeletal material within this study. In order to accomplish this, a sample range of palaeopathological studies from articles, previous doctoral dissertations and monographs were examined. From these studies, a list of pathologies was created to see which pathologies most palaeopathological studies set out to observe and record. A sample of 25 studies were compared from all over the world and with material from very different time periods (see Appendix K). The studies were selected based on their defining themselves as a palaeopathological study looking at any aspect of health and disease within an archaeological population or number of populations. Enamel hypoplasias (dental defects indicative of non-specific physiological stress) were the most frequently assessed lesion, as they were examined in 76.0% of the studies. Comparison between studies was difficult at times, as Ortner and Aufderheide (1991: 1) discuss there is a wide variation in how lesions and anomalies are described and recorded. In many cases they describe the overall diagnoses rather than the specific location and description of the lesions present. As Ortner (1991: 8) is quoted above as saying, one of the main problems still plaguing palaeopathological studies is the variation in presentation and specific aspects of bone anomalies which are currently being assessed. Other lesions most commonly looked at include: periostisis (non-specific inflammation of the bone surface with porous woven bone) in 56.0% of studies; dental caries (destruction of tooth structure by microbial action) in 48.0% of studies; trauma (accidental or incidental injury to the skeleton) in 40.0% of studies; ante-mortem tooth loss and osteoarthritis (degenerative joint disease characterised by eburnation, porosity, osteophytic growth and subchondral sclerosis) in 32.0% of studies and other various pathologies or diseases particular to a site or period depending on the study. In 48.0% of the studies 'anaemia', a hematopoietic disease often involving iron deficiency, was assessed for as reflected in the prevalence of a set of pathological lesions including porotic hyperostosis (the thinning of the outer table of the skull and thinking of diploë between the two skull tables with porosity observed - which was specifically assessed for in 48.0% of studies and cribra orbitalia (porosity and bone growth on the superior aspect of the frontal orbits – which was specifically assessed for in 72% of studies). The pathologies which are listed above are typical for assessing the health status of a population. The pathologies listed within the above discussion were also examined within this research on the three skeletal samples from Chalcolithic Cyprus, however with some limitations based on surface preservation, fragmentation and the commingled nature of the skeletons. The list below discusses the common pathologies observed and some of the issues of assessment within this study.

2.2.7 Assessing Pathological Expression

2.2.7.1 Osteoarthritic Changes

Osteoarthritis or degenerative joint disease is characterised by porosity, eburnation (polishing of the articular surface once the cartilage of a joint is destroyed), subchondral bone sclerosis (hardening of the underlying bone once the cartilage of a joint has been destroyed) and osteophytic growth (bony outgrowths typically on joint surfaces or at their margins) at the articular surfaces where the cartilage has broken

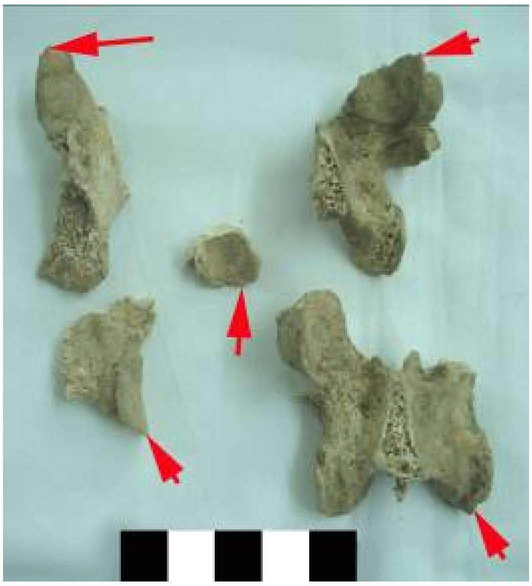
Figure 2.11: A thoracic vertebra with evidence of osteoarthritic changes in the form of porosity and osteophytic growth to the superior articular facets (posterior view, superior is up) from Tomb 162 Cranium A.

down and allowed the two bones of a joint to rub together (Aufderheide and Rodriguez-Martin 1998: 93-96; Waldron 2009:33-34). A diagnosis of osteoarthritis requires that a number of articular surfaces within the skeleton display lesions or changes (Waldron 2009: 31-39). Since preservation and skeletal completeness are so poor within the samples examined for this research, there are rarely enough joint surfaces preserved of a discrete skeleton to diagnose osteoarthritis. As the epiphyses of the long bones are typically not preserved and the surface condition of the bone due to diagenesis is quite poor, it is difficult to assess for eburnation, subchondral bone sclerosis and porosity making it almost impossible to diagnose osteoarthritis in the Chalcolithic bones. Therefore, for this study, the term 'osteoarthritic changes' is used where there are elements of osteoarthritis expressed such as osteophytic growth and/or porosity and/or remodelling of the articular surface indicating a mal-articulation (Figure 2.11).

The causes for these changes may in some cases be due to simple natural breakdown of the cartilage through the general wear and tear of activities (primary or idiopathic) or altered from another event or disease (secondary) such as trauma (Aufderheide and Rodriguez-Martin 1998: 93). Other degenerative joint diseases such as diffuse idiopathic skeletal hyperostosis (DISH), rheumatoid arthritis or ankylosing spondylitis (AS) require several joints to display specific pathological lesions in order to be able to diagnose the disease and thus it is difficult to diagnose a particular disease within the commingled sample. While not explicitly stated in the interpretations, where the lesions involved with these diseases are observed on discrete bones (such as ankylosed vertebrae), the above listed particular diseases cannot be ruled out. This approach demonstrates the benefits of describing the pathology on a bone by bone basis rather than simply providing a diagnosis.

Osteoarthritic changes to the vertebrae are amongst the most common pathologies observed in archaeological samples (Aufderheide and Rodriguez-Martin 1998: 96). Often these degenerative changes involve porosity and pitting of the vertebral bodies, including Schmorl's nodes. It must be noted, that the vertebrae observed for this study in most cases could not be assessed for these lesions as the vertebral bodies did not often survive intact and surface preservation is so poor that the defects could not be seen (Figure 2.12). It was quite difficult to compare as previous studies either examined the incomplete spinal columns based on individuals or commingled material based on discrete vertebrae (i.e. Blau 2001; Eshed *et al*. 2010; Faccia and Williams 2008; Herschkovitz *et al.* 1993). The material within this study, is highly fragmentary and highly commingled in many cases making it impossible to study the vertebrae based on discrete vertebrae. Therefore the observations of pathology affecting the vertebrae are limited to individuals.

Figure 2.12: Example of poor vertebrae preservation with fragments of lumbar vertebrae from Kissonerga-*Mosphilia* Grave 505 Skeleton A and mild osteoarthritic changes to the articular facets (where identifiable- posterior view, superior is up)



Due to the poor preservation levels of the bones, it was decided that it was beneficial to start the analyses with as large a sample as possible and then subdivide it by age and sex. It must be remembered, in terms of pathological expression on the articular surfaces within this population, that the less dense trabecular bone of epiphyses and joints do not tend to survive as well as the denser cortical bone which composes the diaphysis of the long bones. The prevalence and joints affected within a population will vary according to activity which in turn correlates to sex and age based divisions of labour (Steckel and Rose 2002). Because osteoarthritic changes are typically age-related changes, those aged skeletally subadult as individuals were not included within the analysis.

Osteoarthritic changes are amongst the most common pathologies observed on the skeletal remains within this study however in most cases it is impossible to determine if there is bilateral expression of the pathology within a single individual or even if all articular surfaces of a particular joint are affected. Because of the poor preservation, when examining the prevalence and patterns of osteoarthritic changes amongst the discrete individuals, a joint was considered present when one articular surface could be assessed. This level of assessment is not typical. In other studies, degenerative changes to the joints of an individual are only calculated when a joint is intact and when more than one joint is present for the individual (i.e. Eshed *et al.* 2010: 126). Osteoarthritic changes were recorded by presence or absence and then by type of osseous change observed on the articular facet. Analysis of the frequency of osteoarthritic changes was accomplished by bone element and articular surface affected, indicating which joint would have been affected.

Osteoarthritic changes are related to the age of the individual, as they represent a degenerative change to the joints based on use or disease. Therefore, the large number of children and infants recovered from the settlement sites will have a significant impact on the observation of osteoarthritic changes on individuals from those two sites when calculating overall percentage of individuals affected within the skeletal sample. As previously stated, therefore, it was decided not to include any of the children or infants within the analysis of osteoarthritic changes.

2.2.7.2 Trauma

Trauma affects a skeleton in four main ways according to Ortner: ‘(1) complete break in a bone, (2) an abnormal joint or displacement or dislocation of joints, (3) a disruption in nerve and/or blood supply, and (4) an artificially induced abnormal shape or contour of bone’ (2003: 119). Trauma, within this study, typically reflects either a fracture (Ortner’s first type of trauma) or other form of force on the bone (Ortner’s third type of trauma) which would have likely resulted in a soft tissue hematoma and has formed new bone growth on the bone or altered the morphology (Aufderheide and Rodriguez-Martin 1998: 19-27; Waldron 2009: 138). This may be of accidental or incidental aetiology as there does not seem to be any indication of interpersonal violence on any of the bones from any of the sites. Perimortem trauma is almost impossible to assess given the fragmentary nature of most of the bones.

Osseous changes due to trauma, such as fracture or localized subperiosteal thickening are described and recorded based on location and bone element.

2.2.7.3 Dental Caries

When analysing the prevalence of dental disease based on the individual, only those individuals with one or more tooth were included in the analysis. Dental caries is a bacterial disease which demineralises the inorganic portion of the tooth enamel and destroys the organic portion (Aufderheide and Rodriguez-Martin 1998: 402-404; Hillson 2005:290-303). This destruction causes a hole or cavity to form in the crown or root (Hillson 1996: 269). Diet, dental hygiene and the pH of the saliva can all have an impact on the occurrence of dental caries in regards to their formation, location and severity (Hillson 1996: 276-284).

Caries were recorded based on presence or absence followed by their general size and location on the tooth crown. Caries are easily recognizable for the most part when a cavity has formed, although early stages of the lesion would likely be missed within this sample due to the surface discolouration (Figure 2.13). There is risk of underestimating the frequency due to the fact that many of the teeth were found loose and damaged which could preclude identification or pathological assessment. If a tooth crown was destroyed by a caries and could not be identified, it would not have been recorded as a carious lesion but as an unidentifiable tooth fragment. There is also a possibility of underestimating the frequency of occurrence of caries due to ante-mortem tooth loss caused by a carious lesion. Analysis was not carried out, at this point, based on the location on the crown of the lesion as the focus of this study was not on dental caries but general health status and disease prevalence. Therefore, the assessment was focussed on a presence or absence basis to reflect the general observation of caries within the population. Future studies should include a more

Figure 2.13: Example of carious lesions on the distal side of the right second maxillary premolar (distal view, buccal is right) and occlusal side of the right second maxillary molar (occlusal view, buccal is right) from Souskiou-*Laona* Tomb 228 Skeleton E.

detailed analysis of nature and location of the caries (Hillson 2001) and radiographs should be employed to allow for better identification of the smaller interproximal caries.

2.2.7.4 Calculus

Calculus is mineralized plaque deposits caused by a build up of micro-organisms against the tooth surface (Hillson 1996: 255; Lieverse 1999). These are described as 'clay-like deposits' on the tooth surface in archaeological samples (Hillson 2005: 288-289). Calculus was described and recorded using Hillson's definitions of either supraginival or subgingival types of expression (Hillson 1996: 256-257). Since calculus expression not very severe when compared to Hillson's base of mild, moderate and severe, they do not necessarily reflect his descriptions. Mild for the skeletal groups within this study implies a thin line, ridge, fleck or patch, moderate is an obviously raised ridge and severe is a more substantial ridge, sometimes a plank of calculus covering a portion of the crown (Hillson 1996: 259; Figure 2.14).

Figure 2.14: Examples of the calculus levels mild, moderate and severe within the Chalcolithic samples – left image presents mild supragingival calculus ridge on left maxillary lateral incisor and canine from Kissonerga-*Mosphilia* Grave 532 (labial view, occlusal is bottom). The centre image presents moderate supragingival calculus ridges on the mandibular central incisors and right lateral incisor from Souskiou-*Laona* Tomb 200 Skeleton D (lingual view, occlusal is up). The right image presents severe supragingival calculus planks covering the distal, buccal and lingual sides of the crown of the right first mandibular molar from Lemba-*Lakkous* Grave 50 (distal view, buccal is right).

Calculus was recorded on an individual tooth basis, however when it occurs it typically affects most if not all of the teeth in the dental arch, therefore where only one or two teeth within a dentition belonging to the same individual are affected it may be that the calculus has flaked off due to post-mortem action. While calculus is a common irritant leading to the erosion of the alveoli in periodontal disease (Ortner

2003: 593), periodontal disease was not assessed in a systematic way within these skeletal samples due to the poor preservation of the alveoli in most cases.

2.2.7.5 Enamel Hypoplasias

In general dental enamel hypoplasias are a deficiency in the amount or thickness of enamel, resulting from a disruption in the secretory/matrix formation phase of amelogensis caused by a physiological stress as the tooth crown forms (Aufderheide and Rodriguez-Martin 1998: 405; Goodman and Armelagos 1985: 479; Schwartz 1995: 162-164; Skinner and Goodman 1992: 155; Suckling 1989). Enamel defects can range in appearance from single or multiple pits or small furrows or grooves, to deep and wide troughs of decreased enamel thickness and ultimately to entirely missing enamel (Goodman and Rose 1990: 64). Due to the nature of the taphonomic damage to the tooth surfaces within the skeletal samples of this study, it is not possible to assess for hypoplastic pits and only linear defects were recorded. Linear enamel hypoplasias (hereafter LEH) are the most commonly encountered defect by anthropologists, and refers to ‘a marked horizontal or nearly horizontal area of decreased enamel thickness’ best viewed on the buccal side of the tooth (Boldsen 2007: 132; Goodman and Rose 1990: 65-66; Skinner and Goodman 1992: 157). The hypoplastic lesions are considered a non-diagnostic indicator of metabolic and nutritional disturbances from which we can infer general health status through life (Aufderheide and Rodriguez-Martin 1998: 405; Boldsen 2007: 132; Fitzgerald 2006: 179; Goodman *et al.* 1987; Roberts and Manchester 2005: 75). LEH was recorded as present or absent and the general severity and location on the tooth crown of the lesion was noted (Figure 2.15). Analysis of LEH prevalence was conducted based on presence or absence and the more detailed analysis of location on the tooth crown was not included, as with the caries, due to the focus of this research on the general health status as indicated by the

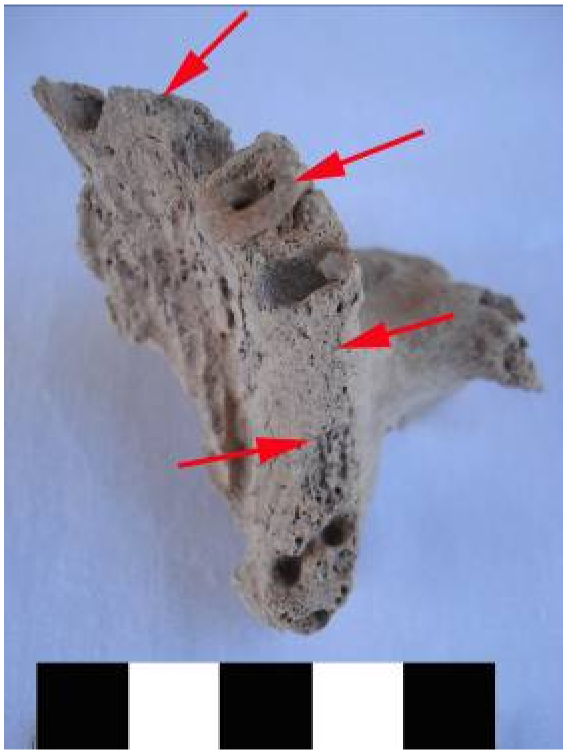
Figure 2.15: Examples of LEH on teeth from Kissonerga-*Mosphilia* Grave 567: mild on central incisors (centre two teeth: left and right) and moderate to severe on canines (far most left and right teeth) (labial view, occlusal is down)

presence of the pathological lesions. As well, analysis of LEH based on the location of the defect on the tooth crown requires the use of dental callipers, to measure the precise location of the groove, which were not used within this examination of the teeth.

2.2.7.6 Ante-Mortem Tooth Loss

There are a number of causes for tooth loss during life, including trauma, bone loss and/or dental disease in the form of periodontal disease, dental caries or periapical bone loss (Waldron 2009: 238-239). In an archaeological sample it is often impossible to determine which cause has resulted in the loss of the tooth. For this study, the maxillae and mandibles were examined for ante-mortem tooth loss which was described based on the state of the alveolar bone in which the tooth was supposed to have been situated. The alveolus was described based on its state of porosity and resorption as an indication of how long before death the tooth was lost in general terms (Figure 2.16). There is some confusion about congenital absence of a tooth and tooth loss many years prior to death where the alveolar bone is resorbed with no porosity or indication of the socket. Radiographs may aid in determining whether the tooth is congenitally absent. The tooth which is missing was recorded and analysis revolved around the missing teeth by position.

Figure 2.16: *In vivo* tooth loss of the left lateral maxillary incisor and first and second left maxillary molars indicated from the left maxilla fragment from Souskiou-*Laona* Tomb 200 Cranium A (inferior view, anterior is top). Note also, the heavily worn and decayed left first premolar is indicated.



2.2.7.2 Attrition

'Although not a dental disease *per se*, dental wear is the 'natural result of masticatory stress upon the dentition in the course of both alimentary and technological activities' (Powell 1985: 308), and it can occur on the biting or occlusal surfaces of the teeth during grinding of the crowns of the teeth against each other' (Roberts and Manchester 2005: 78). Attrition can predispose a tooth to carious lesions and result in apical cavities due to infection through the tooth root (Roberts and Manchester 2005: 65, 69, 78). There are a number of factors which affect the wear on teeth, however diet , food processing methods and use of the teeth as a tool in particular can be considered the leading contributing factors to the gradients of tooth wear (Roberts and Manchester 2005: 78-79). 'Heavy attrition' is recorded within this study where there is significant loss of crown due to wear (Figure 2.17). For attrition to be discussed in a more systematic way, measurements of crown height using dental callipers would be necessary. There are other types of attrition which were observed at all three sites in regards to unusual wear patterns on the occlusal side of the tooth. Unusual wear on both the anterior and posterior teeth was observed, though as it is not pathological and is likely due to either bite position or the use of the teeth as a tool, it will not be discussed within the current study[9].

Figure 2.17: Moderate to heavy attrition indicated on the right first molar, right first premolar and left first molar, second premolar, first premolar and canine on maxillary fragments from Souskiou-*Laona* Tomb 108 North Skeleton (lingual view, occlusal is up, left side is on the right side of the image and the fragment on the left side of the image is the right maxilla). Note the lack of wear on the right lateral maxillary incisor.

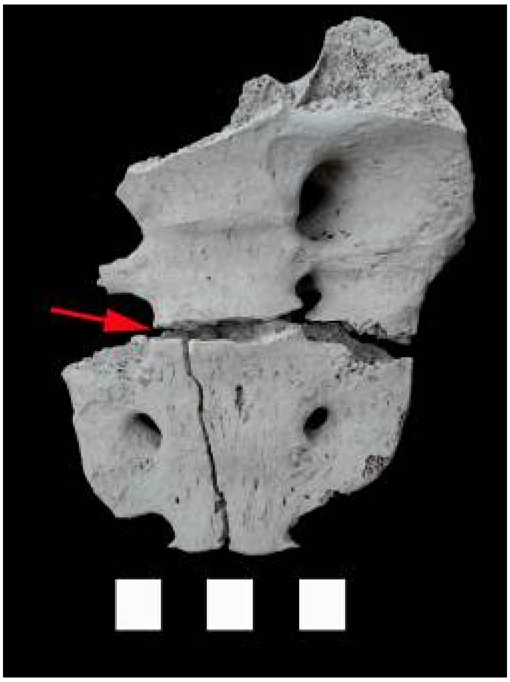
2.2.7.8 Developmental Defects

Developmental anomalies are a product of pathological changes in the normal development during the foetal stage of life (Aufderheide and Rodriguez-Martin 1998: 51). The most common cause of these abnormalities is genetic and many of them affect the skeleton, though any body part can be involved. Overall, congenital abnormalities are rare in most populations and when observed with an increased

[9] i.e. Eshed *et al.* 2006: 153 for the use of teeth as tools.

prevalence within a population, may indicate a biological relatedness (Aufderheide and Rodriguez-Martin 1998: 52-76). The only congenital defects observed on the skeletal samples within this study affect the spine and pelvis, in the form of possible transitional vertebrae at the lumbosacral level and possible absence of teeth (Figure 2.18). The spinal anomaly was possibly observed on three sacra from Souskiou-*Laona*, however as noted in Aufderheide and Rodriguez-Martin, 'sometimes it is difficult to assess the presence of transitional vertebrae if the spine is not completely preserved' (1998: 65). All three sites contain at least one individual where there is a possible congenital absence of teeth, predominately the third molars. As well, all three sites contain possible evidence of symphalangism of the intermediate and distal foot phalanges, which may represent a congenital trait affecting the fifth ray bilaterally (Steinberg and Reynolds 1948). While there may be other congenitally anomalous bones within the samples, the poor preservation and commingled nature makes assessment quite difficult and none were observed through the course of this research.

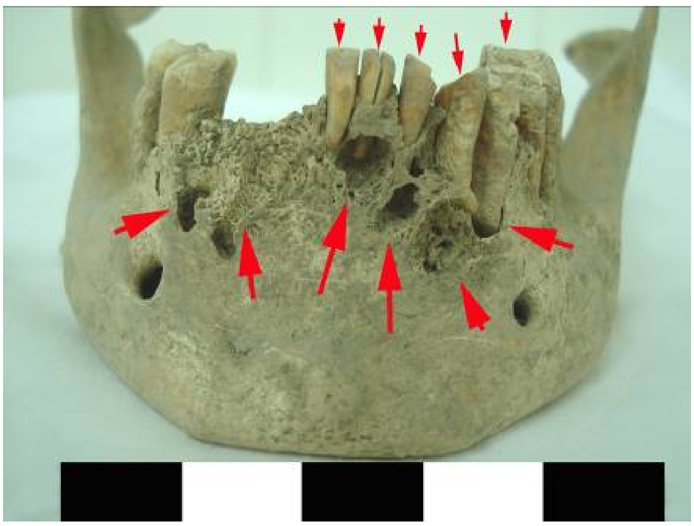
Figure 2.18: Possible transitional vertebra between the third and fourth sacral vertebrae in the sacrum from Souskiou-*Laona* Tomb 158 Skeleton A (anterior view, superior is up).



2.2.7.9 Infections

Infections which affected the bones were recorded on the skeletal samples within this study in the form of apical abscesses, woven bone within a sinus cavity and bony callous' where a cloaca had formed due to trauma.

Figure 2.19: Mandible with apical abscesses indicated, reflecting a general osteomyelitis from Kissonerga-*Mosphilia* Grave 571 (anterior view, inferior is down). Note as well the heavy attrition on the anterior teeth.



Apical abscesses were observed in several of the maxillae and mandibles from the settlement sites. Apical abscesses are formed when the root pulp cavity and root of a tooth are exposed from attrition, trauma or dental disease and the exposed tissue becomes infected forming a cavity at the apex of the root (Aufderheide and Rodriguez-Martin 1998: 409; Waldron 2009: 241-242). Osteomyelitis is an inflammation of the bone caused by pus-producing bacteria (Aufderheide and Rodriguez-Martin 1998:172; Ortner 2003: 181-197). It can affect any bone in the skeleton (Figure 2.19). Woven bone within the sinus cavity can be an indication of a chronic sinus infection (Merrett and Pfeiffer 2000; Roberts 2007). It was not very commonly observed but bears mentioning. A bony callous reflects the lamellar bone growth meant to strengthen the site of trauma. In cases where the bone becomes infected often a cloaca will form to allow the release of pus built up and becomes a feature of the callous (Ortner 2003: 181-185). When observed on the skeletal material examined for this study, the location of the lesion and a description of osseous changes were given.

2.2.7.10 Diseases or Disorders

For this study, the general terms of 'disease or disorder' are used to describe limited types of lesions observed which may relate to osseous changes due to a metabolic disorder such as scurvy, infectious or hematopoietic disease such as iron-deficiency anaemia. Since there is a limited way that the bones can react to an assault, the diagnoses of a particular disease typically requires a number of skeletal elements to be involved to in a particular way and there can be some overlap in the individual expression on a particular bone[10]. The lesions which are commonly associated with diseases or disorders within an archaeological skeletal sample include porotic hyperostosis or cribra orbitalia. Porotic hyperostosis is identified by symmetrically distributed resorption of the outer table of the frontal and parietal bones which results in the exposure of the diploë beneath. This is usually observed to its most minor degree and appears as a patch of porosity on the ectocranial surface of the skull (Aufderheide and Rodriguez-Marin 1998: 348-350). Cribra orbitalia is similar to porotic hyperostosis, but located only in the orbital roofs of the frontal orbits and is

[10] For information on the different ways in which bones react to different diseases or disorders see for example: Aufderheide and Rodriguez-Martin 1998: 117-246, 305-343, 345-356; Roberts and Manchester 2005: 164-250 and Waldron 2009: 83-136.

viewed as a more sensitive indicator for the underlying disease (Aufderheide and Rodriguez-Martin 1998: 350). While a general appearance of porous bone either on the ectocranial surface of the parietal or frontal bones or within the frontal orbits may represent porotic hyperostosis or cribra orbitalia, both lesions require a specific set of criteria to be present to be identified which is not always macroscopically visible. Radiographs are required to ascertain if the 'hair-on-end' appearance of this lesion occurs and there is thickening of the diploë (Aufderheide and Rodriguez-Martin 1998: 350; Roberts and Manchester 2005: 229). Recent research also indicates that certain vitamin or mineral deficiencies can also be related to the appearance of cribra orbitalia or porotic hyperostosis and must be considered as a possible cause for their occurrence along with various metabolic disorders, infectious or hematopoietic disease (i.e. vitamin B/folic acid deficiency in Walker *et al.* 2009). Therefore, there is conservative use of the terms cribra orbitalia and porotic hyperostosis within this study with preference given to describing the lesions and using the more general descriptor of 'porous bone'.

As the skeletal material within this study is typically in poor preservation, highly incomplete and with eroded surfaces, and often commingled with many individuals, it is difficult to be certain that a particular disease is affecting the individual. The pathologies recorded for this study which are diagnosed as possibly reflecting a disease or disorder are: cribra orbitalia or porosity of the superior aspects of the frontal orbits, porotic hyperstosis or porosity and/or thickening of the calvarium, general porosity of the cortical bone of the long bones and/or bowing or alterations in the morphology of the long bones (Figure 2.20). These general pathological indicators can represent a number of different diseases including various vitamin or mineral deficiencies or bacterial or viral attacks. The aetiologies of these various diseases are all quite different, from environmental to nutritional, making a specific diagnosis difficult to achieve within the archaeological context, thus a differential diagnosis approach is followed. Differential diagnosis a mentioned earlier, refers to the standard palaeopathological practice of providing all possible diagnoses for a given lesion observed and logically assessing which is most likely the cause of a particular lesion or set of lesions.

Figure 2.20: Example of mild porosity (possible cribra orbitalia) in the frontal orbits of the cranium from Lemba-*Lakkous* Grave 32 (anterior-inferior view, anterior-superior is up).

Other pathologies such as Harris lines and certain congenital abnormalities which require a radiographic observation were not recorded as radiographs have yet to be done for this collection. The main reason that any anomalies could not be assessed for these particular populations is because of surface preservation and/or extreme fragmentation due to the fragile nature of the skeletal remains from taphonomic processes. However, there are positive results to be had with these remains and as Blau states, 'whether the remains are well preserved or not, all bone specimens are irreplaceable and, consequently, it is our responsibility to protect, treat with respect and obtain as much information as possible from them' (2001: 200).

2.2.8 Statistical Analysis Methods

After the information had been collected from the skeletal elements, the data was entered into the statistical package, *Statistics Package for Social Scientists (SPSS)* in a spreadsheet format. Within this spreadsheet each element is described and discussed in a set of coding which was created for this study. The basis of the scales used for the description of the bone element and the pathologies are based on Buikstra and Ubelaker (1994), *Standards for Data Collection from Human Skeletal Remains* (see Appendix J for all codes, scales and descriptions). *SPSS* was chosen for its ability to do more complicated statistical analysis with the data provided. Other programs which are compatible with *SPSS* include *Microsoft Excel* and *Microsoft Access*. In order to get a clear image of the different sites' demographic and pathological profiles, independent spreadsheets were created which included information by individual and by tomb.

Based on the different burial types within the three sites, namely that there are commingled and discrete individuals, it was necessary to deal with three different data sets. The first is a comparison of the 223 individuals represented as discrete skeletal remains (for example the number of individuals which display any pathology compared to the overall number of individuals) and includes the demographic information gathered about the discrete skeletons. The second involves the comparison of the skeletal elements by section and as separate/individual elements (for example a comparison of all humeri, taking into account which sections of the bone are preserved). Differences based on age and sex comparisons are made where possible. The third set of data created discusses the differences based on the discrete mortuary feature, to account for the commingled individuals which are not included in the first section analysing discrete individuals (for example the prevalence of a pathology with regard to the overall minimum number of individuals in tombs with commingled skeletal material).

In order to deal with elements that were often fragmented and difficult to quantify properly such as the ribs and vertebrae, it was decided to deal with these elements only on the basis of the individual and discrete mortuary feature, recording the prevalence based on either presence or absence on the bones from a discrete individual and within a discrete mortuary feature. This is necessary in order to get a more accurate reflection of prevalence within the populations. If we were to include these elements from the commingled remains, it would make it exceptionally difficult to determine whether the elements displaying the pathology were from the same skeleton or not. Since the bone material is so fragmentary it can be even difficult to tell if fragments are from the same element.

The statistical analysis of the material involved descriptive statistical results, examining frequency of a particular pathology on a particular bone element. It was important for understanding the frequency of a particular pathological expression that all comparisons are done in relation to the same sections. For example, dental caries are more common on the posterior teeth, so the results for dental pathology were calculated by tooth type (for further description see Waldron 2007: 63). Each skeletal element section is compared to like sections of the same element. Once the results of frequency and prevalence were processed by site, these were compared to the other sites. In order to gain a clearer understanding of the types of pathologies observed and the minimum number of individuals who are affected with a specific pathology to a specific bone, a bone-by-bone analysis of pathological expression of the skeletal material from all three sites was conducted. When looking at the pathologies on a bone-by-bone basis, there will be no discussion of adjacent bones which may have been affected by the pathology as it is most often not possible to associate a joint together. In other words, the results presented in this section will focus on what is present, not on what is missing.

With regard to the presentation of the observed pathologies based on bone element, it is necessary to consider the two main hypotheses which direct this research. To address the first one, regarding preservation, it was decided to record and discuss the bones by particular element to allow for more description. This section on bone elements could have been presented by the different pathologies observed rather than by bone element, however it was felt that more detail could be conveyed by bone element. To deal with this as well, a table (Table 3.324) is provided at the end of the bone element results section which lists the different pathologies and the bone elements which display evidence of those particular lesions.

The types of pathologies were recorded by tomb in regards to location within the Souskiou-*Laona* cemetery. This provides an idea of distribution of pathologies within the cemetery in order to determine if there was any spatially relevant pattern of prevalence of a particular pathology within the cemetery. The 27 tombs observed from the Souskiou-*Laona* cemetery for this study were selected based on the looting action therefore the spatial distribution of the tombs examined is not necessarily statistically random, but determined by actions which are beyond the scope of this analysis. A preliminary examination of the distribution of pathologies at the settlement sites indicated that there did not seem to be any observable pattern of distribution of pathologies amongst the graves and further analysis was not deemed productive for the settlement sites. The results generated by discrete mortuary feature represent more or less theoretical percentages of prevalence of the different pathologies observed if there were complete skeletons present. Overall, for the discussion of pathologies within this section there will be no discussion of pathological expression based on age or sex, due to the fact that in many cases the material is commingled and cannot be associated with a particular individual.[11] The discussion of 'individuals' within the mortuary feature analysis section refers to a minimum number of discrete people who could have been affected with a particular pathology based on the overall expression of that pathology within the tomb. For example, if two left first metatarsals display osteoarthritic changes to the proximal epiphysis, a minimum of two individuals within that burial group display osteoarthritic changes to at least one foot. Analysis within the mortuary feature analysis section focuses on the percentage of tombs with individuals with particular pathologies and the minimum number of individuals affected with a particular pathology given the overall minimum number of individuals for the sites. This is more of a theoretical assessment of the minimum number of individuals with pathologies, as many individuals' at all three sites are incomplete due to poor preservation and poor recovery in the case of the settlement sites.

Once the frequency of a particular pathology was determined, Chi-squared and/or OneWay ANOVA tests were done to test the statistical significance of the differences or similarities observed. The importance of these tests is to see if what appears to be a trend actually is one based on a statistical analysis. Cramer's V was used to determine the strength of the relationship. It is presented as a percentage of how strong the relationship between the two variables is, the higher the percentage, the stronger the association. When a significant difference was calculated using the OneWay ANOVA test, the significant differences between the discrete sites was established by a Tukey HSD test to establish where the significant differences were derived. Therefore, a comparison of the different types of pathologies observed on the different levels of expression, either individual, element or tomb, is provided in Chapter 3. These analyses will provide the basis of the discussion of the general disease processes observed from all three sites.

[11] For discussion on the expression of pathologies based on independent individuals, please refer to the individuals discussion section within this chapter.

2.2.9 Terminology

For this study there is a particular vocabulary used which best suits the material examined. An 'individual' is a distinct unit or group of skeletal elements which can be associated with one person. When a group of bones can be conclusively associated together as being from one person, for this study, they are referred to as a 'discrete' individual or skeleton. When the term 'articulated individual' or 'articulated skeleton' is used, it reflects an inhumation where there are a number of bones which can be conclusively associated with a single person and are found in proper anatomical position. This may reflect a primary inhumation burial. A 'disarticulated individual/skeleton' represents a single inhumation where there is only one person present but the bones were not recovered in proper anatomical position. This may reflect secondary processing of the remains or disturbance after deposition. A 'cranium' refers to a group of cranial bones which were excavated together and represent a single independent individual, however there are no postcranial bones. On the occasions where the mandible is present with the cranium this is noted in the inventory. 'Elements' are defined here as particular bone or body parts entered as one single data entry. In the case of highly fragmentary parts such as ribs or vertebrae, they were most often grouped together as a single data entry. Due to the fragmentary nature of the skeletal material it was often possible to roughly identify the bone but without details such as side or type. For example, there are highly fragmentary pieces of vertebrae which cannot be assigned to a vertebral group type. These bones are recorded as 'indeterminate' as no further identification is possible.

The skeletal material examined for this study included both articulated individuals and commingled human remains, which had been disturbed some time after initial burial. Within the tombs from Souskiou-*Laona* the commingled material which can be observed in a specific mortuary context, are referred to as 'bonestacks'. A 'bonestack' includes the skeletal remains of one to nine individuals placed against the sides of the tomb with the long bones oriented together, the other bones scattered within and the crania placed on top (see above for more detail and Crewe *et al.* 2005). Therefore, to gain a better understanding of the true health status of the entire mortuary population from the Chalcolithic period, it was essential that each bone element was considered as an independent component since it is impossible to attribute a particular element to a particular individual (this means that the pathologies observed on a specific bone element will be presented as a percentage of that particular bone element). This part of the study includes both adult and subadult bone elements. The term ‘subadult’ is used within this paper to refer to individuals or skeletal tissue which have an estimated age under 21 years at death. Subadult refers to individuals within the foetus, infant, child and adolescent age groups based on Buikstra and Ubelaker (1994). In general, subadult individuals cannot be provided with a sex determination (as noted above in this chapter), however some of the older adolescents may have an assessed sex as they are more skeletally mature at 18-20 years of age at death. Subadult skeletal elements with pathology are calculated independently of the adult skeletal material. The term ‘discrete mortuary feature’ is used within this study to include both graves and tombs from all sites. Therefore, ‘burial context’ refers to the type of burial, either discrete articulated skeleton, disarticulated skeleton, cranium, bonestack or commingled skeletal material, within the discrete mortuary feature. Within some tables, the notation ‘CBA’ is used (a list of abbreviations can be found at the beginning of this thesis). ‘CBA’ means cannot be assessed and refers to an inability to either determine sex or estimate age or to assess a skeletal element for pathology.

2.3 Conclusions

This chapter has outlined the nature and context of the skeletal material which forms the basis of this study. The sample skeletal series’ which are studied within this thesis are grouped together based on the fact that they represent a general population which inhabited the island during the same time period. As noted above, it is important not to assume that they were related genetically and may not be connected in any way other than chronological period. There are certain limitations to the assessment of pathological expression on skeletal material due to the burial programmes at the three sites and to the aggressive taphonomic processes on Cyprus. To deal with these problems, descriptive scales of surface condition and fragmentation were created which allowed for a more qualitative analysis of the skeletal material and provided greater scope for understanding the frequency of pathological expression on the skeletal material. The pathologies which can be assessed within these skeletal collections are discussed and the method which was employed to analyse them is listed. The following chapter will present the results of the analysis and observations of the pathological expression on the skeletons from all three sites with comparison of the results.

Chapter 3: Results

This chapter presents the results of the analyses based on the observations of pathologies on the skeletal series from Souskiou-*Laona*, Lemba-*Lakkous* and Kissonerga-*Mosphilia*. The results provided within this chapter illustrate that palaeopathological information can be derived from the poorly preserved remains and are presented with three different foci. First of all, the material which can be attributed to an individual is analysed and compared. This is followed by an analysis of all the skeletal material on the basis of the bone elements, focussing on the types of pathology observed. Finally, the prevalence of pathologies within the discrete mortuary features amongst the three sites is compared. The data is presented with these three foci to allow for different levels of detailed comparison of the prevalence of different pathologies observed amongst the sites. It is necessary to examine the material on a bone element basis as discussed above, due to the commingled nature of most of the Souskiou-*Laona* contexts. However, despite the changes in method and process required to include the commingled remains, doing so provides a more precise reflection of the prevalence of pathologies observed within the mortuary population within Souskiou-*Laona* cemetery. Demographic information is included where possible to illuminate the differences in pathological expression between the sexes and amongst the different age groups, in an effort to determine if there are patterns of expression of a particular pathology.

3.1 Palaeopathological Analyses of the Discrete Skeletons

There is a minimum of 263 individuals derived from all three sites, of which 231 are identified as discrete individuals[12]. The tables below present basic demographic information for all sites under study combined.

Table 3.00: Percentage of different types of burial contexts of discrete individuals

Type of burial	**Count**	**Percent**
Articulated Skeleton	100	43.3
Disarticulated Skeleton	41	17.7
Cranium	90	39.0
Total	231	100.0

[12] See Chapter Two: Terminology – noting that 'Discrete Individual' refers to a collection of skeletal elements which can be associated with a single individual.

Table 3.01: Age distribution of the discrete skeletons for all three sites

Age Group	Count	Percent
Foetus	2	.9
Infant	36	15.6
Child	47	20.3
Adolescent	21	9.1
Young adult	68	29.4
Adult	14	6.1
General adult	33	14.3
General subadult	10	4.3
Total	231	100.0

Figure 3.1: Age distribution of the discrete skeletons for all three sites

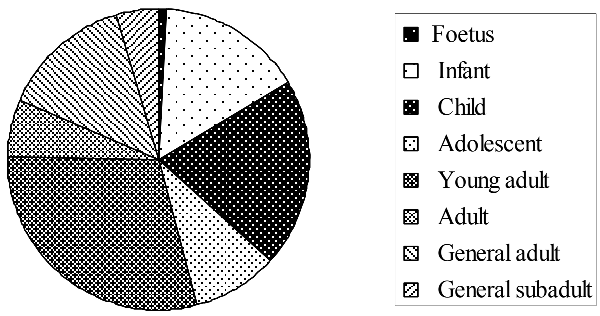


Table 3.02: Distribution of sexes of the discrete individuals at all sites

Sex	Count	Percent
CBA*	27	11.7
Male	29	12.6
Female	72	31.2
Subadult	103	44.6
Total	231	100.0

*CBA= Cannot Be Assessed

Figure 3.2: Percentage of discrete skeletons by sex

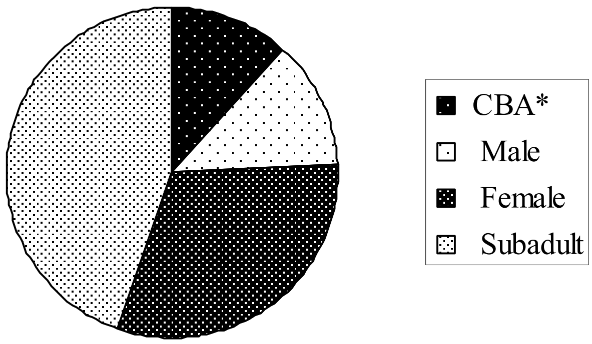
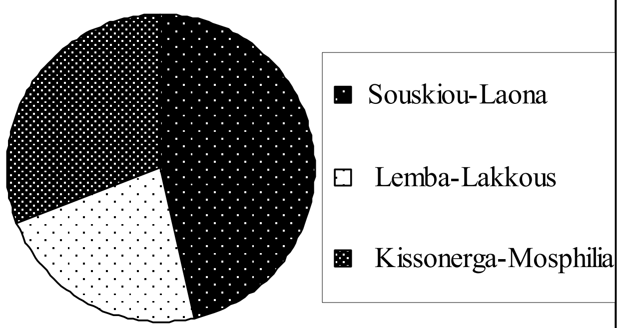


Table 3.03: Percentage of total discrete individuals by site

Site	Count	Percent
Souskiou-*Laona*	107	46.3
Lemba-*Lakkous*	53	22.9
Kissonerga-*Mosphilia*	71	30.7
Total	231	100.0

Figure 3.3: Percentage of discrete skeletons from each site



3.1.1 Souskiou-Laona

Of the total minimum number of individuals observed for this study from Souskiou-*Laona* (n=125), 85.6% (n=107) are represented by some form of discrete skeletal remains (Table 3.04 and Figure 3.4). The rest of the individuals which were examined are derived from the bonestacks. The age distribution of discrete individuals from Souskiou-*Laona* is provided in Table 3.05 and Figure 3.5. The greatest proportion of discrete individuals are young adults (with a median age between 21-35 years). Table 3.06 and Figure 3.6 presents the sex distribution across the site of the 85 adults or older adolescents for whom sex could be assessed. There are more than twice the number of females than males. Overall, 59.4% (n=63) of the discrete individuals do not display any evidence of pathology.

Table 3.04: Percentage of different contexts of discrete individuals

Type of burial	Count	Percentage
Articulated Skeleton	29	27.1
Disarticulated Skeleton	2	1.9
Cranium	76	71.0
Total	107	100.0

Figure 3.4: Percentage of each burial context of discrete skeletons from Souskiou-Laona

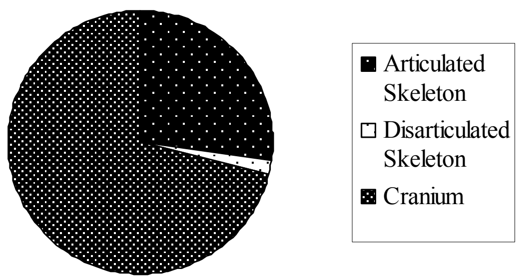


Table 3.05: Age distribution of the discrete individuals at Souskiou-*Laona*

Age Group	Count	Percent
Infant	1	0.9
Child	10	9.3
Adolescent	11	10.3
Young adult	44	41.1
Adult	6	5.6
General adult	28	26.2
General subadult	7	6.5
Total	107	100.0

Figure 3.5: Percentage of discrete skeletons from each age group from Souskiou-Laona

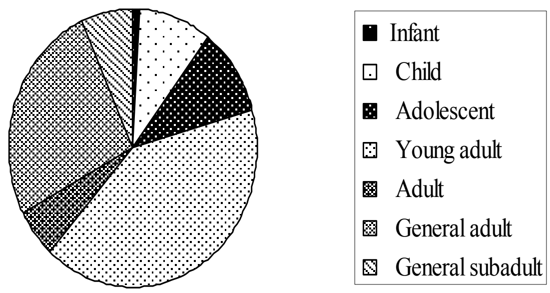
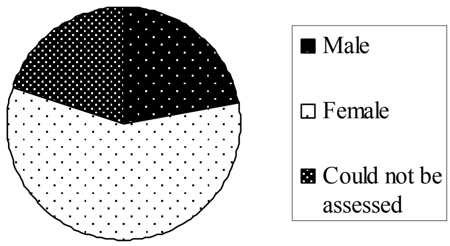


Table 3.06: Sex distribution of adult discrete individuals at Souskiou-*Laona*

Sex	**Count**	**Percent**
Male	19	22.4
Female	49	57.6
Could not be assessed	17	20.0
Total	85	100.0

Figure 3.6: Percentage of each sex of the adult discrete skeletons at Souskiou-Laona



3.1.1.1 Dental Disease

There are 84 individuals with teeth from Souskiou-*Laona* which will be included in this discussion, most of whom do not have complete sets of dentition for their respective age. Table 3.07 presents the percentage of each age group affected with a particular dental pathology and the overall totals. Dental caries are the most common pathology observed. Within this group, most display only one or two teeth with caries, however at least three individuals have four teeth which display caries. Calculus, as well, is typically only observed on one or two teeth, however there are six individuals with five or more teeth which display accumulated calculus. Heavy attrition was frequently observed on more than one tooth of a particular individual. LEH are the least frequently observed dental pathology at Souskiou-*Laona.*

Table 3.07: Percentage of each age group with dentition affected by a specific dental pathology at Souskiou-*Laona*

Age Group	**Calculus**	**Caries**	**LEH**	**AMTL***	**Attrition**[13]
Infant (n=1)	0.0	0.0	0.0	0.0	0.0
Child (n=10)	10	10	0.0	0.0	0.0
Adolescent (n=10)	0.0	30	10	20	0.0
Young Adult (n=44)	34.1	43.2	15.9	6.8	22.7
Adult (n=6)	66.7	33.3	0.0	33.3	16.7
General Adult (n=13)	0.0	0.0	0.0	14.3	30.8
Totals (n=84)	23.8	29.8	9.5	10.6	17.9

* Ante-mortem tooth loss percentages do not include individuals who do not have either maxilla or mandibular fragments to assess.

Of the 84 individuals with teeth, 11.9% (n=10) could not be assessed for ante-mortem tooth loss as there was no maxilla or mandible recovered (see Table 3.08). Ante-

[13] As noted in Chapter 2, attrition is not a pathology, however it is included within the dental pathologies section as is involves the teeth and can be associated with general oral health and diet.

mortem tooth loss was recorded for nine individuals from Souskiou-*Laona*, one of whom did not have any teeth present (due to ante and post-mortem loss) and four of whom had lost at least three teeth *in vivo*.

Table 3.08: Percentage of maxillae and mandibles present at Souskiou-*Laona*

Maxilla/Mandible	**Count**	**Percent of total discrete individuals with teeth (i.e. recovery percentage)**
CBA (no mandible/maxilla present)	10	11.9
Maxilla Present	42	50.0
Mandible Present	38	45.2

As is expected, the infants and children display significantly fewer dental pathologies than those with an estimated adult age. Expression of dental caries seems to be more severe in older individuals as 100.0% of adults (median age 36-50 years at death) with caries display more than one lesion, while 52.6% of the young adults with caries display more than one caries. As well, the older the individuals display more *in vivo* tooth loss, which is consistent with expectations as the teeth are in use longer with more opportunity to be lost.

Table 3.09 reflects the distribution of dental pathologies based on sex assessment of the adults and older adolescents. Despite the fact that far more females were recovered than males, distribution of pathologies is quite similar between males and females, other than in the expression of LEH. The discrepancy in sample size between the sexes is addressed by comparing percentages rather than numbers of occurrence. There is no statistically significant difference between the sexes and the occurrence of dental disease (Chi Squared $p=0.179$).

Table 3.09: Percentage of each sex which are affected by a pathology at Souskiou-*Laona*

Sex	**Calculus**	**Caries**	**LEH**	**AMTL***	**Attrition**
Male (n=15)	33.3	33.3	6.7	13.3	20.0
Female (n=45)	28.9	35.6	15.6	15.2	24.4
CBA (n=11)	9.1	18.2	0.0	0.0	9.1

* Ante-mortem tooth loss percentages do not include individuals who do not have either maxilla or mandibular fragments to assess.

3.1.1.2 Osteoarthritic Changes

Osteoarthritic changes on the postcranial bones were assessed for 31 discrete skeletons at Souskiou-*Laona*. Table 3.10 (Figure 3.7) presents the levels of completeness for discrete skeletons with postcranial bone. Table 3.11 provides the age distribution of the discrete skeletons with postcranial bone. The largest single demographic group are the 'young adults'.

Table 3.10: Completeness levels of the discrete skeletons with postcranial material from Souskiou-*Laona*

Percentage of Skeleton Present	Count of Individuals	Percent of Individuals
15-25	3	9.7
26-50	11	35.5
<50	17	54.8
Total	31	100.0

Figure 3.7: Percentage of discrete skeletons by the percentage of the skeleton present at Souskiou-Laona

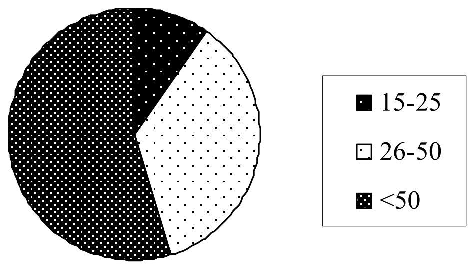


Table 3.11: Age distribution of the discrete skeletons with postcranial material from Souskiou-*Laona*

Age Group	Count	Percent
Child	1	3.2
Adolescent	2	6.5
Young adult	23	74.2
Adult	2	6.5
General adult	3	9.7
Total	31	100.0

As Table 3.12 illustrates, the majority of the discrete individuals with postcranial material have one or more body part with osteoarthritic changes to an articular surface[14]. Therefore, the preservation of many of the articular surfaces at Souskiou-*Laona* is sufficient to allow palaeopathological analysis.

Table 3.12: Percentage of discrete individuals with osteoarthritic changes

Preservation and osteoarthritic changes	Count	Percent
One or more body part with osteoarthritic changes	18	58.1
No osteoarthritic changes on preserved joints	10	32.2
No joints preserved	3	9.7
Total	31	100.0

[14] Please refer back to Chapter 2 regarding joint preservation – a joint is considered present if one articular surface is present.

Table 3.13 and Figure 3.8 shows the joints which were assessed and the number which are present and the percentage of that joint present affected by osteoarthritic changes. The bones of the feet (i.e. metatarsal or foot phalanx) display the highest prevalence of osteoarthritic changes of any the preserved joints assessed. The knee (i.e. distal epiphysis of the femur, the patella and the proximal epiphysis of the tibia) is the most poorly preserved. Only three individuals had at least one articular surface of a knee joint present which could be assessed for pathology. However, as Table 3.14 shows, when examined by joint, the knee is the second most frequently effected joint after the hand. Table 3.14 presents the number of surviving body parts for all 31 of the discrete individuals and the percent of those body parts which display osteoarthritic changes from Souskiou-*Laona*.

Table 3.13: Percentage of individuals with osteoarthritic changes by joint from Souskiou-*Laona*

Joint	**Count Present**	**Count with OA changes**	**Percent of individuals with OA changes**	**Number of Individuals with Osteoarthritic changes and nature of expression**
Vertebrae	27	8	29.6	2 – cervical 1 – thoracic 1 – lumbar 3 – more than one vertebral group 1 – unknown vertebrae
Ribs	23	2	8.7	2 individuals
Feet	18	6	33.3	6 – unilaterally
Elbow	17	5	29.4	4 – unilaterally 1 - bilaterally
Ankle	14	2	14.3	2 – unilaterally
Hand	25	8	32.0	6 – unilaterally 2 – bilaterally
Shoulder	15	1	6.7	1 – unilaterally
Wrist	16	3	18.8	2 – unilaterally 1 – bilaterally
Hip	10	1	10.0	1 – unilaterally
Knee	3	1	33.3	1 – unilaterally

Figure 3.8: Percentage of discrete individuals with osteoarthritic changes to a specific joint

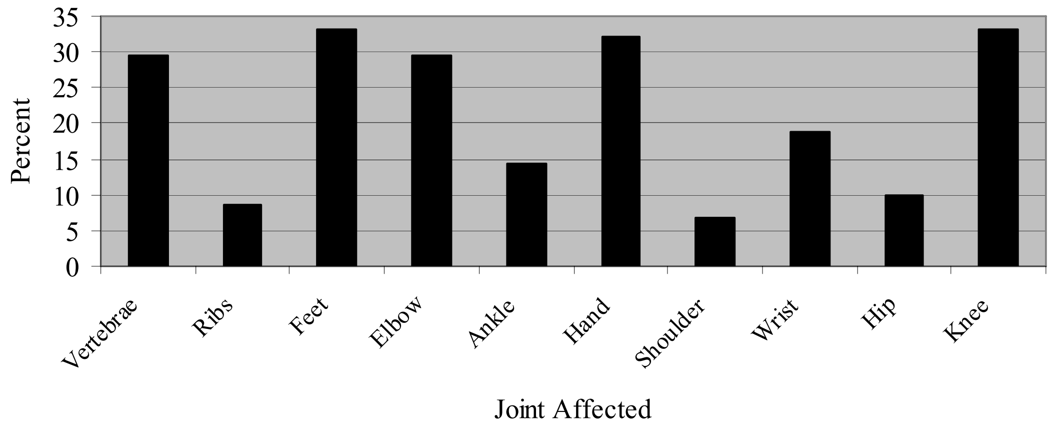


Table 3.14: Percentage of body parts of discrete individuals with osteoarthritic changes for Souskiou-*Laona**

Body Part	**Count of body parts present**	**Count with body parts with OA changes**	**Percent of body parts with OA changes**
Feet	26	6	23.1
Elbow	29	6	20.7
Ankle	21	2	9.5
Hand	36	10	27.8
Shoulder	20	1	5.0
Wrist	23	4	17.4
Hip	16	1	6.3
Knee	4	1	25.0

*The vertebrae and ribs are not included within this table as they were analysed on a discrete individual basis.

In regards to osteoarthritic expression based on age groups, the one articulated child within this sample could not be assessed for osteoarthritic changes due to poor preservation of the joint surfaces (Tomb 236 Skeleton A). Only one of the two adolescents could be assessed for osteoarthritic changes and this represents an older female adolescent (Tomb 193 Skeleton E) for whom there is some discrepancy in age assessment as the fused sternal epiphysis of the clavicle indicates an older individual. This individual displays mild osteophytic growth at the distal epiphysis of a metacarpal as well as mild osteophytic growth on the sternal epiphysis of the right clavicle. Young adults represent the largest portion of the discrete skeleton sample at Souskiou-*Laona* (74.2%) and display the majority of the pathologies observed on the discrete individuals. Of those with an estimated age between 21-35 years at death, 60.9% display at least one joint with osteoarthritic changes. Only one of the 23 young adult individuals could not be assessed for osteoarthritic changes. While the majority of the individuals only displayed the degenerative changes on one or two bones, there were three individuals who display osteoarthritic changes on four, five and seven bones respectively.

Skeleton C from Tomb 200, a possible male, in particular stands out with at least seven bones (or bone groups) affected, including all vertebral groups, the right elbow, the right and left hands and left foot (see Appendix D for more information and Figure 3.9). Skeleton A from Tomb 192, a female, displays osteoarthritic changes to at least one wrist, two elbows and hand phalanges, while Skeleton A from Tomb 201, another female, displays osteoarthritic changes to a vertebral body, acetabulum, tarsal, metatarsal and foot phalanx. Interestingly, both the females also display evidence of fairly severe trauma to the hand (Tomb 192) and arm (Tomb 201) which would have impacted their movement. There are only two female skeletons with an estimated median age between 36-50 years, labelled as ‘adults’, both of which have one bone/body part which displays osteoarthritic change. Skeleton D from Tomb 200 displays osteoarthritic changes to the spine and a distal radial fracture (osteoporosis is not observed, however if present, it may represent a Colles’ fracture) which may have impacted the articulation of the wrist, however the bones of the wrist are primarily absent. Skeleton F from Tomb 165 displays mild osteophytic growth of a proximal foot phalanx. There are three discrete skeletons for which no age assessment was possibly beyond ‘general adult’. The only general adult to display any osteoarthritic changes is from Tomb 208 with one talus affected.

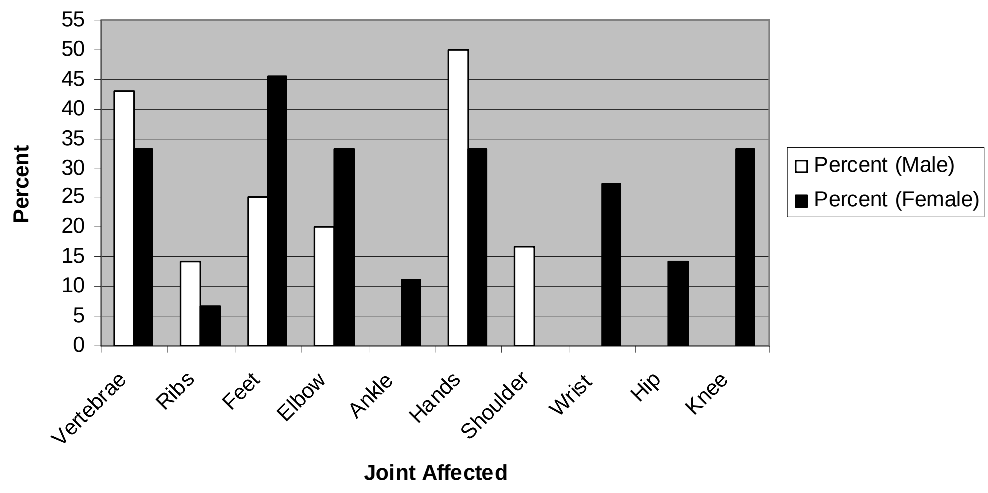
Figure 3.9 Superior view of a lumbar vertebra with osteoarthritic changes in the form of osteophytic growth indicated by the arrows from Souskiou-*Laona* Tomb 200 Skeleton C

Four of the seven males and 13 of the 18 females observed within the discrete skeletons display osteoarthritic changes. Table 3.15 and Figure 3.10 present a joint by joint comparison of the percentage of individuals present based on that specific joint. Overall, the differences in distribution of osteoarthritic changes based on sex, are not statistically significant (Chi Squared p=0.303). This considers only those with an assessed sex of male/possibly male or female/possibly female. Both sexes display degenerative changes to the vertebrae, ribs and elbow with no statistically significant difference. It is not possible to explore the differences in osteoarthritic changes at the knee as there were no surviving articular surfaces of the knee for any of the males.

Table 3.15: Percentage of individuals with osteoarthritic changes by joint and sex

Joint	**Male - No. Affected/No. Present**	**Percent (Male)**	**Female No. Affected/No. Present**	**Percent (Female)**
Vertebrae	3/7	42.9	5/15	33.3
Ribs	1/7	14.3	1/15	6.7
Feet	1/4	25.0	5/11	45.5
Elbow	1/5	20.0	4/12	33.3
Ankle	0/3	0.0	1/9	11.1
Hands	3/6	50.0	5/15	33.3
Shoulder	1/6	16.7	0/10	0.0
Wrist	0/5	0.0	3/11	27.3
Hip	0/4	0.0	1/7	14.3
Knee	0/0	0.0	1/3	33.3

Figure 3.10: Percentage of each sex with osteoarthritic changes on a specific joint



3.1.1.3 Trauma

There is evidence of trauma affecting at least 19.4% (n=6) of the discrete skeletons from Souskiou-*Laona* (Table 3.16)[15]. When analysed by sex, 22.2% of the females and 28.6% of the males display trauma to at least one bone. There is no statistically significant difference in expression of trauma between males and females (Chi Squared p=0.254). All but one of the incidences of trauma identified occurs on the hands or arms.

Table 3.16: Individuals with evidence of trauma from Souskiou-*Laona*

Context	**Age**	**Sex**	**Bones with trauma**	**Description**
Tomb 158 Skeleton A	Young Adult	Male	Right 1st metacarpal	Possible trauma with bone growth on the proximal third of the diaphysis, palmar aspect and accentuated palmar curve. – Figure 3.11
Tomb 200 Skeleton C	Young Adult	Possible Male	Left 1st metacarpal	Possible fracture as proximal third of diaphysis is thickened and twisted laterally. – Figure 3.12
Tomb 228 Skeleton E	Young Adult	Possible Female	Right 1st metacarpal	Fracture with an osteophyte projecting to the palmar aspect from proximal epiphysis with lateral twist in the proximal third of the diaphysis creating a curvature. – Figure 3.13
Tomb 200 Skeleton D	Adult	Possible Female	Right radius	Distal radial fracture with tuberosity extended posteriorly and unusual articulation on the posterior aspect of the lateral side. Shortened length but very well-healed. - Figure 3.14
Tomb 201 Skeleton A	Young Adult	Female	Right radius	(Parry?) fracture begins 30mm distally of the radial tuberosity with lateral curvature of the bone diaphysis and most callous growth on lateral side with a possible cloaca. - Figure 3.15
Tomb 192 Skeleton A	Young Adult	Possible Female	Proximal and intermediate hand phalanges	Boutonniere deformity – ankylosis of the proximal and intermediate phalanges in a fixed curve with an interior arc of 43mm from proximal epiphysis to distal. – Figure 3.16

[15] For further description within the context of the entire skeleton, please see Appendix D.

Figure 3.11: Possible trauma to right first metacarpal with arrow indicating bone growth and curvature observed on medial view of bone from Tomb 158 Skeleton A

Figure 3.12: Possible fracture of the left first metacarpal with arrow indicating where diaphysis appears twisted with bone growth in proximal third. Dorsal view from Tomb 200 Skeleton C.

Figure 3.13: Fractured right first metacarpal with arrows indicating bone growth and point of fracture from the palmar view looking proximally. Tomb 228 Skeleton E

Figure 3.14: Fracture at the distal end of the right radius from Souskiou-*Laona* Skeleton D Tomb 200 anterior view with arrow indicating fracture (right radius on the left and left radius of the same individual on the right)

Figure 3.15 Posterior view of a fractured right radius with bony callous from Souskiou-*Laona* Tomb 201 Skeleton A with arrows indicating fracture (on left – pictured with left radius from the same individual)

Figure 3.16: Boutonniere deformity with fusion of a proximal and an intermediate hand phalanx. Lateral or medial view, as bone is unsided, with arrows indicating bone growth which has ankylosed the joint from Tomb 192 Skeleton A

3.1.1.4 Disease or Disorder or other pathological expression

Table 3.17 presents the percentage of each demographic group which display evidence of a disease or disorder and of the total (n=107) discrete individuals. This does not prove to be a statistically significant difference based on sex determination (Chi Squared p=0.544). All three individuals display porosity within the superior aspect of the frontal orbits, possibly reflecting cribra orbitalia. The extent of the porosity is difficult to assess due to post-mortem damage. As all three individuals fall into different age groups, there is no statistically significant difference based on age (Chi Squared p=0.159).

Table 3.17: Percentage of individuals with evidence of disease or disorder by sex from Souskiou-*Laona*

Demographic Group	**Count with evidence of disease**	**Percent with evidence of disease**	**Context references**
Female Adult	2	4.1	Tomb 165 Cranium A Tomb 189 Cranium D
General Adult	1	5.9	Tomb 161 Cranium C
Total	3	2.8	

Other pathologies which do not fall into the above categories were observed on four of the 107 (3.7%) discrete skeletons from the sample at Souskiou-*Laona*. Tomb 155 Skeleton B exhibits alveolar resorption of the mandible where there is bone missing between the right first and second molars. Severe post-mortem damage and small fragment size makes it impossible to assess the extent of the resorption (Figure 3.17). The maxilla from Tomb 192 Cranium C also displays alveolar resorption on the left side with porous bone between the three molars and bone resorption. This maxilla also possibly displays a small pit (c.11mm diameter) of remodelled bone within the sinus cavity however, post-mortem damage makes the extent impossible to assess (Figure 3.18). Tomb 220 Cranium C displays an apical abscess, 8.8mm wide, at the root apex of the maxillary left first molar with porous bone within (Figure 3.19). Tomb 165 Cranium D displays an unusual depression in the right parietal which is still in articulation with the frontal. The depression is in the ectocranial vault at the junction of the coronal and sagittal sutures and is approximately ten by ten millimeters with no evidence of bone remodelling and it does not transfer through to the endocranial surface, there is no specific aetiology determined.

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Figure 3.17: (Top left image)
Alveolar resorption of the right first and second molars is indicated by the arrows on a mandible (lingual view) from Tomb 155 Skeleton B.

Figure 3.18: (Top right image)
Alveolar resorption and small lesion within the sinus cavity are indicated by the arrows (superior view of left maxilla fragment) from Tomb 192 Cranium C.

Figure 3.19: (Image to the left)
Apical abscess is indicated by the arrow above the where the left maxillary first molar would have been (anterior view) from Tomb 220 Cranium C.

3.1.2 Lemba-Lakkous

Of the minimum number of individuals at Lemba-*Lakkous* (n=58), 91.4% (n=53) are represented by some form of discrete skeletal remains (Table 3.18). The rest of the individuals are commingled within the graves and typically only represented by a small portion of the skeleton. The age distribution of discrete individuals derived from Lemba-*Lakkous* is provided in Table 3.9. The greatest proportion of individuals are young children (with a median age between 3-12 years at death). Table 3.20 presents the sex distribution across the site of the 19 adults or older adolescents for whom sex could have been assessed. Females, again represent the largest proportion of adults with an assessed sex. Overall, 62.3% (n=33) of the discrete individuals at Lemba-*Lakkous* do not display any evidence of pathology.

Table 3.18: Percentage of different burial contexts of discrete individuals

Type of burial	Count	Percent
Articulated Skeleton	26	49.1
Disarticulated Skeleton	21	39.6
Cranium	6	11.3
Total	53	100.0

Figure 3.20: Percentage of each burial context of discrete skeletons from Lemba-Lakkous

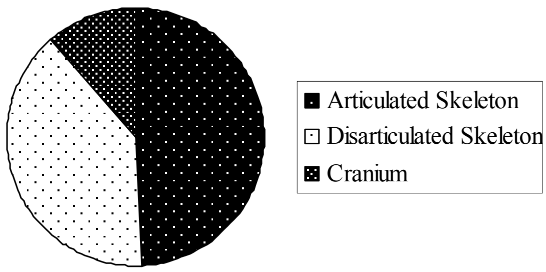


Table 3.19: Age distribution of the discrete individuals at Lemba-*Lakkous*

Age Groups	Count	Percent
Infant	15	28.3
Child	18	34.0
Adolescent	5	9.4
Young adult	7	13.2
Adult	4	7.5
General adult	4	7.5
Total	53	100.0

Figure 3.21: Percentage of discrete skeletons from each age group from Lemba-Lakkous

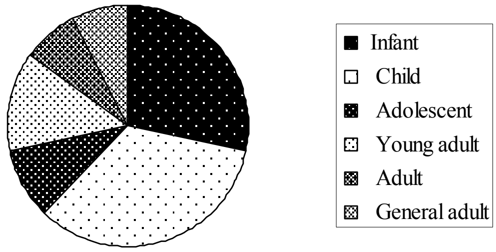
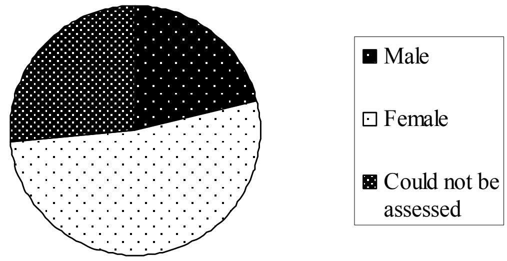


Table 3.20: Sex distribution of adult discrete individuals at Lemba-*Lakkous*

Sex	**Count**	**Percent**
Male	4	21.1
Female	10	52.6
Could not be assessed	5	26.3
Total	19	100.0

Figure 3.22: Percentage of each sex of discrete adult skeletons from Lemba-Lakkous



3.1.2.1 Dental Disease[16]

There are 49 individuals with teeth from Lemba-*Lakkous* which will be included in this discussion, most of whom do not have complete sets of dentition for their respective age. Table 3.21 displays the percentage of the different age groups affected with different dental pathologies and the overall number of individuals with a particular pathology. Dental caries are the most common pathology observed on the dentition of the individuals derived from Lemba-*Lakkous*. Most individuals display caries on only one or two teeth. However, at least one individual has four teeth with carious lesions and one individual has three carious teeth.

Table 3.21: Percentage of each age group with dentition affected by a pathology

Age Group	**Calculus**	**Caries**	**LEH**	**AMTL***	**Attrition**
Infant (n=12)	0.0	8.3	0.0	0.0	0.0
Child (n=18)	0.0	11.1	0.0	0.0	0.0
Adolescent (n=5)	40.0	40.0	20.0	25.0	0.0
Young Adult (n=7)	42.9	85.7	28.6	14.3	14.3
Adult (n=4)	75.0	50.0	25.0	75.0	100.0
General Adult (n=3)	0.0	33.3	0.0	100.0	66.7
Totals	16.3	28.6	9.5	15.4	14.3

* Ante-mortem tooth loss percentages do not include individuals who do not have either maxilla or mandibular fragments to assess.

[16] The results presented within this section are those of this current study. For comparison to the previous analysis by Lunt (1985), please refer to Appendix F. Each grave description includes the differences between the current analysis and Lunt's.

Calculus was the second most prevalent dental pathology observed amongst the individuals. Most of the individuals who display calculus do so on only one or two teeth, however there are two individuals with five or more teeth which display accumulated calculus. Once again, LEH is the least frequently observed dental pathology amongst the individuals.

Of the 49 individuals with teeth, 20.4% could not be assessed for ante-mortem tooth loss as there was no maxilla or mandible recovered (Table 3.22). Ante-mortem tooth loss was recorded for six individuals from Lemba-*Lakkous*, one of whom has either lost at least six teeth *in vivo* or they are congenitally absent (Figure 3.23). Where heavy attrition is observed, typically more than one tooth is affected and in two cases, five or more of the teeth present are severely worn (Graves 35 and 22).

Table 3.22: Percentage of maxillae and mandibles present at Lemba-*Lakkous*

Maxilla/Mandible	**Count**	**Percent of total discrete individuals with teeth (i.e. recovery percentage)**
CBA (no mandible/maxilla present)	10	20.4
Maxilla Present	20	40.8
Mandible Present	33	67.3

Figure 3.23: Superior view of the mandible of the individual from Grave 25, missing all six mandibular molars.

As is expected, dental pathology occurs more frequently and with greater severity in the older age groups, as the teeth have been in use longer. The result that 100% of adults with no specific age estimation (general adults) display ante-mortem tooth loss (Table 3.21) is artificially high reflecting the poor preservation of the mandible and maxilla as only one individual from that age group had either bone element present. The severity of expression of attrition and calculus gets progressively higher the older the individual. Fifty percent of those with an estimated age between 36-50 years at death (‘adult’) display severe attrition on five or more teeth examined and calculus affects more than one tooth for all three individuals with calculus from this age group.

Table 3.23 reflects the distribution of dental pathologies based on sex assessment of adults and older adolescents, once again, only of those with teeth associated with the individual are included. Overall, distribution of pathologies is quite similar between males and females despite the fact that far more females were recovered than males. There is no statistically significant difference between the sexes and the appearance of dental disease (Chi Squared p=0.522). Interestingly, males tend to have more severe expression of heavy attrition, as all three of the individuals have at least three teeth affected. All three of these males have an estimated age of 'adult'. Ante-mortem tooth loss, while more prevalent in males, is more severe in females in regards to expression. One young adult female is missing at least six teeth (Grave 25 – Figure 3.4).

Table 3.23: Percentage of each sex which are affected by a dental pathology

Sex	Calculus	Caries	LEH	AMTL*	Attrition
Male (n=4)	50.0	50.0	25.0	50.0	75.0
Female (n=10)	40.0	70.0	20.0	33.3	30.0
CBA (n=4)	50.0	50.0	25.0	50.0	25.0

* Ante-mortem tooth loss percentages do not include individuals who do not have either maxilla or mandibular fragments to assess.

3.1.2.2 Osteoarthritic Changes

Osteoarthritic changes on the postcranial bones were assessed for 47 discrete skeletons at Lemba-*Lakkous*. Table 3.24 and Figure 3.24 presents the levels of completeness for discrete skeletons with postcranial bone. Table 3.25 provides the age distribution of the discrete skeletons with postcranial bone. The largest demographic group are 'children'.

Table 3.24: Completeness levels of the discrete skeletons with postcranial material from Lemba-*Lakkous*

Percent of Skeleton Present	Count of Individuals	Percent of Individuals
1-15	18	38.3
16-50	13	27.7
<50	16	34.0
Total	47	100.0

Figure 3.24: Percentage of discrete skeletons by the percentage of the skeleton present at Lemba-Lakkous

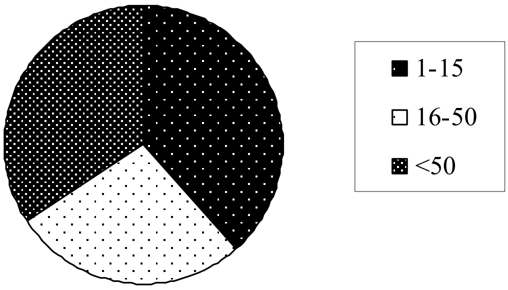


Table 3.25: Age distribution of the discrete skeletons with postcranial material from Lemba-*Lakkous*

Age Groups	Count	Percent
Infant	13	27.7
Child	15	31.9
Adolescent	5	10.6
Young Adult	6	12.8
Adult	4	8.5
General Adult	4	8.5
Total	47	100.0

None of the 28 children or infants examined, display evidence of osteoarthritic changes and are unlikely to due to the relationship between older age and increased osteoarthritic changes (Gignac *et al.* 2006). Therefore, 19 individuals (with an estimated age over 12 years at death) are included in the analysis of postcranial osteoarthritic changes at Lemba-*Lakkous*. As Table 3.26 illustrates, while the majority of the adult or adolescent discrete individuals with postcranial material at Lemba-*Lakkous* display osteoarthritic changes to the preserved joints, the number of individuals with no osteoarthritic changes is only slightly less. Preservation is quite poor and in some cases an individual only had one articular surface present from the entire skeleton.

Table 3.26: Percentage of discrete individuals with osteoarthritic changes

Preservation and osteoarthritic changes	Count	Percent
One or more body part with osteoarthritic changes	9	47.4
No osteoarthritic changes on preserved joints	7	36.8
No joints preserved	3	15.8
Total	19	100.0

Table 3.27(and Figure 3.25) shows the joints which were assessed and the percentage of individuals with that joint present which were affected by osteoarthritic changes. Vertebrae are the most frequently affected joints amongst the individuals from Lemba-*Lakkous*. None of the articular surfaces of the tarsals or knee or hip joints displayed any osteoarthritic changes. In regards to preservation of the joints, the wrist (consisting of carpals) is the most poorly preserved, most likely due to issues with recovery. However, as Table 3.28 shows, when examined by joint, the wrist and shoulder are the most frequently affected joints. Table 3.27 presents the number of surviving body parts for all 19 of the discrete individuals and the percent of those body parts which display osteoarthritic changes from Lemba-*Lakkous*.

Table 3.27: Percentage of individuals with osteoarthritic changes by joint from Lemba-*Lakkous*

Joint	**Count Present**	**Count with OA changes**	**Percent of individuals with OA changes**	**Number of Individuals with Osteoarthritic changes and nature of expression**
Vertebrae	16	9	56.3	2 – atlas 2 – axis 2 – atlas and axis 3 – more than one vertebral group
Ribs	13	1	7.7	1 individual
Feet	13	3	23.1	3 – unilaterally
Elbow	9	2	22.2	1 – unilaterally 1 - bilaterally
Ankle	10	0	0.0	No pathology
Hand	16	1	6.3	1 – unilaterally
Shoulder	10	2	20.0	2 – bilaterally
Wrist	6	2	33.3	2 – unilaterally
Hip	7	0	0.0	No pathology
Knee	7	0	0.0	No pathology

Figure 3.25: Percentage of discrete individuals with osteoarthritic changes to a specific joint

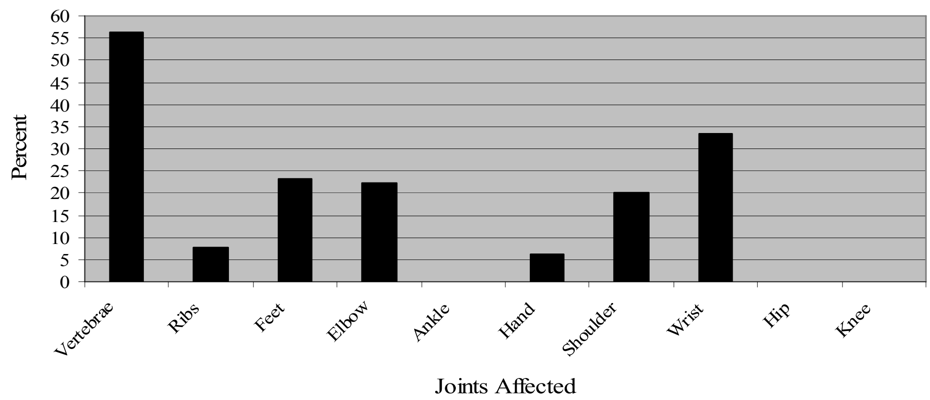


Table 3.28: Percentage of body parts of discrete individuals with osteoarthritic changes for Lemba-*Lakkous**

Body Part	**Count of body parts present**	**Count with body parts with OA changes**	**Percent of body parts with OA changes**
Feet	20	3	15.0
Elbow	13	3	23.1
Ankle	11	0	0.0
Hand	21	1	4.8
Shoulder	16	4	25.0
Wrist	8	2	25.0
Hip	10	0	0.0
Knee	7	0	0.0

*The vertebrae and ribs are not included within this table as they were analysed on an discrete individual basis.

In regards to osteoarthritic expression based on age groups, analysis was based on four age groups (Table 3.29).

Table 3.29: Osteoarthritic changes based on age groups from Lemba-*Lakkous*

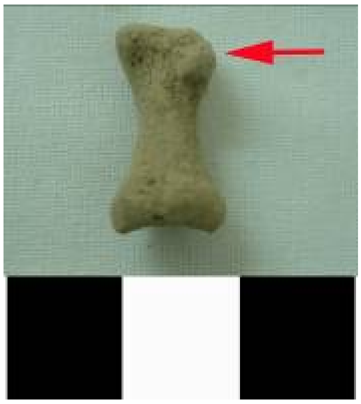
Age Group	**Count with OA changes**	**Percent**
Adolescent (n=5)	1	20.0
Young Adult (n=6)	3	50.0
Adult (n=4)	4	100.0
General Adult (n=4)	1	25.0
Total	9	47.4

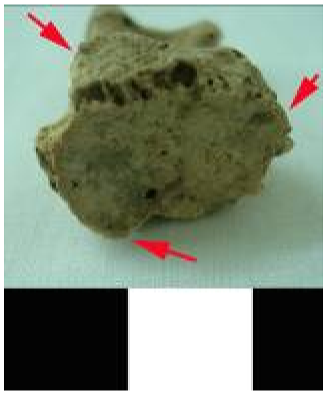
The adolescent individual, aged 12-18 years at death, from Grave 33 displays osteoarthritic changes to the atlas and axis in the form of very small (>3mm) osteophytic growth on the superior aspect of the dens and very mild inferior extension of the dens facet with bone growth (Figure 3.26). None of the other surviving joints for this individual display any evidence of osteoarthritic changes. The female 'general adult' from Grave 22 also displays osteoarthritic changes to the axis and atlas with mild osteophytic growth at the margins of the dens facet on the atlas and a broken off osteophyte from the superior aspect of the dens. The female aged 20-26 years at death from Grave 56 displays mild remodelling of the plantar aspect of the distal epiphysis of a proximal foot phalanx and no other evidence of osteoarthritic changes (Figure 3.27). The young female from Grave 50 displays mild osteoarthritic changes to a proximal foot phalanx with some remodelling of the distal epiphysis. Finally, the young female from Grave 23 displays osteoarthritic changes to the atlas with osteophytic growth extending the dens facet superiorly and osteophytic growth and remodelling of the proximal epiphysis of the left first proximal foot phalanx (Figure 3.28).

Figure 3.26: (Below left image) Very mild osteophytic growth on superior aspect of dens indicated by the arrow (posterior view, superior is up) from Grave 33.

Figure 3.27: (Below middle image) Very mild remodelling of the distal epiphysis of a proximal foot phalanx (plantar view, distal is up) from Grave 56.

Figure 3.28: (Below right image) Mild osteophytic growth around the margin of the proximal epiphysis and remodelling of a left first proximal foot phalanx (proximal view – plantar aspect is up) from Grave 23.



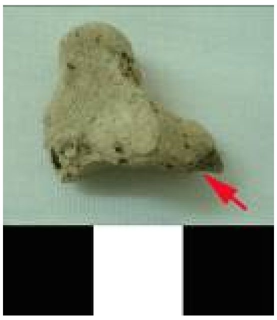


All four of the individuals aged 36-50 years at death display osteoarthritic changes. The male from Grave 53, aged 42-56 years at death, displays osteoarthritic changes on the axis with osteophytic growth on the superior aspect of the dens. The adult male from Grave 30 displays osteophytic growth on the atlas with extension of the dens facet superiorly; the axis with a small osteophyte projecting superiorly; and extension of the superior facets of a thoracic vertebra; as well, there is osteophytic growth on the margins of the glenoid fossae of both shoulders and extension of the left scapula acromion; finally, the acromial ends of both clavicles display porous new bone growth (Figure 3.29). The female adult from Grave 35 displays osteoarthritic changes to the atlas with mild osteophytic growth superiorly directed of the dens facet and right capitate with osteophytic growth at the margins of the third metacarpal articular facets (Figure 3.30). Finally, with perhaps the most extensive osteoarthritic changes of all the individuals at Lemba-*Lakkous*, the male from Grave 26, aged 36-48 years at death, displays a small osteophyte on the superior aspect on the dens of the axis; several thoracic vertebrae display different levels of remodelling and osteophytic growth of the articular facets; several rib fragments exhibit bony extension of the caudal margin and osteophytic growth at the articular facet; finally both elbows display osteoarthritic changes with new woven bone growth with the olecranon fossa of the right humerus and osteophytic growth on the posterior margin of the right and left radial tuberosities and both shoulders display osteophytic growth at the margins of the glenoid fossae projecting laterally and remodelling of the sternal end of the right clavicle (Figure 3.31). Therefore, while osteoarthritic changes seem to be ubiquitous across all age groups within this sample, particularly for the cervical vertebrae, changes to the feet are limited to the young adult age group and changes to the shoulders and hands are limited to the adult age group.

Figure 3.29: (Left image below) Left clavicle (inferior view) displays porous bone growth as indicated by the arrow on the acromial end from Grave 30.

Figure 3.30: (Centre image below) Right capitate (medial view from the hamate) displays bone growth as indicated by the arrow on the distal articular surface from Grave 35

Figure 3.31: (Right image below) Right scapula (lateral-anterior view) displays osteophytic growth around the margin of the glenoid fossa as indicated by the arrows from Grave 26.

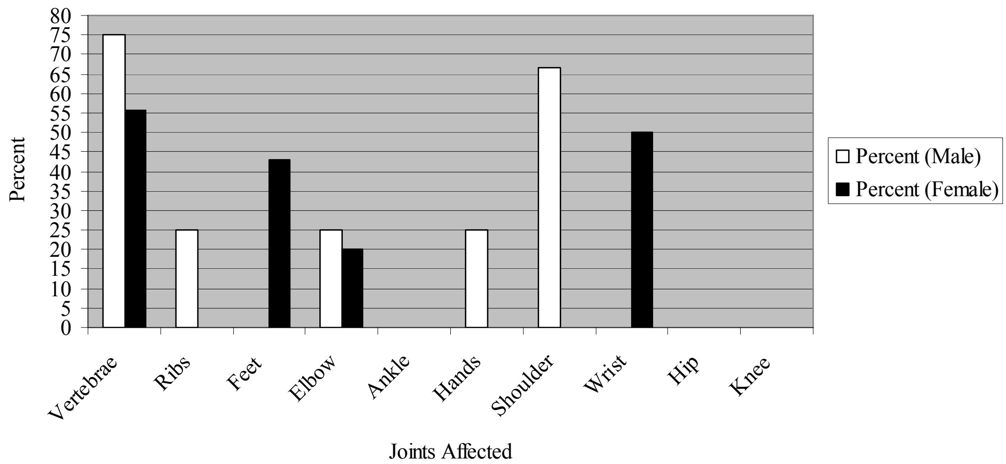




Three of the four males and five of the nine females observed within the discrete skeletons aged over 12 years at death display osteoarthritic changes. Table 3.30 presents a joint by joint comparison of the percentage of individuals affected with osteoarthritic changes based on assessed sex. Other than with the vertebrae and elbows, there are differences in the joints affected with osteoarthritic changes between males and females at Lemba-*Lakkous*. Males display osteoarthritic changes to the ribs, hands and shoulders, while females display osteoarthritic changes to the bones of the feet and wrists. The differences in distribution of osteoarthritic changes based on sex overall, are not statistically significant (Chi-Squared p=0.187)[17].

Table 3.30: Percentage of individuals with osteoarthritic changes by joint and sex and Lemba-*Lakkous*

Joint	**Male - No. Affected/No. Present**	**Percentage (Male)**	**Female No. Affected/No. Present**	**Percentage (Female)**
Vertebrae	3/4	75.0	5/9	55.6
Ribs	1/4	25.0	0/7	0.0
Feet	0/4	0.0	3/7	42.9
Elbow	1/4	25.0	1/5	20.0
Ankle	0/2	0.0	0/4	0.0
Hands	1/4	25.0	0/8	0.0
Shoulder	2/3	66.7	0/6	0.0
Wrist	0/1	0.0	2/4	50.0
Hip	0/1	0.0	0/5	0.0
Knee	0/1	0.0	0/6	0.0

Figure 3.32: Percentage of each sex with osteoarthritic changes on a specific joint



3.1.2.3 Trauma

Two discrete individuals of the 47 examined at Lemba-*Lakkous* display evidence of trauma. An adult male aged 30-42 years at death displays a healing fracture on the proximal epiphysis of a distal hand phalanx (Grave 30 – Figure 3.33). And, a young adult female aged 18-24 years at death displays a patch of woven bone on the medial side of the proximal third of the diaphysis of the tibia, approximately 20x10mm (Grave 50 – Figure 3.34). There is no statistically significant difference of expression

[17] While there is some variation in the p-values across the different joints – none of the results are statistically significant.

of trauma based on sex or age (Chi-squared p=0.522 and p=0.149 respectively). Overall, 4.3% of the discrete individuals at Lemba-*Lakkous* display evidence of trauma.

Figure 3.33: (Left image) Distal hand phalanx displays a healing fracture in the proximal epiphysis (proximal view, palmar surface is superior), as indicated by the arrow from Grave 30.

Figure 3.34: (Image below) Left tibia displays woven bone growth on the proximal third of the diaphysis as indicated by the arrows (medial view, anterior aspect is superior and distal end is to the right) from Grave 50.

<u>*3.1.2.4 Disease or Disorder or other pathological expression*</u>

Table 3.31 presents the percentage of each age group with evidence of a disease or disorder. No males display evidence of disease, as both young adults and the adolescent with lesions are female. One infant, the child and the female adolescent all show porosity in the frontal orbits which may represent cribra orbitalia, the extent of which is difficult to assess in all cases due to post-mortem damage. The other infant with a lesion indicating a disease or disorder displays small patches of porosity on the ectocranial side of several parietal fragments. The fragmentary nature prohibits assessment of the extent of the porosity. The young female adult from Grave 50 displays porosity of both the frontal orbits (possibly cribra orbitalia) and sphenoid, the extent of which is again difficult to

Figure 3.35: Mild porosity in the superior aspects of the orbits of the frontal (anterior view, superior aspect of frontal is posterior) from Lemba-*Lakkous* Grave 50.

assess due the fragmentary nature of the bones (Figure 3.35). This may represent evidence of disease, disorder or deficiency. The other young adult female from Grave 25 exhibits lateral bowing in the middle third of the diaphysis of the right tibia which may reflect cortical thinning of the bone due to disease or disorder such as, but not restricted to, osteomalacia or vitamin D deficiency.

Table 3.31: Percentage of individuals with evidence of disease or disorder by age from Lemba-*Lakkous*

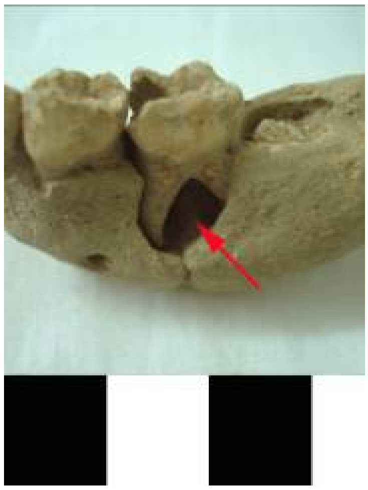
Demographic Group	**Count with evidence of disease**	**Percent with evidence of disease**	**Context references**
Infant	2	13.3	Grave 17 Skeleton C Grave 45
Child	1	5.6	Grave 13
Adolescent	1	20.0	Grave 32
Young Adult	2	28.6	Grave 25 Grave 50
Adult	0	0.0	
General Adult	0	0.0	
Total	6	11.3	

Other pathologies which do not fall into the above categories were observed on three of the 53 (5.7%) discrete skeletons from the Lemba-*Lakkous* sample. The male adult in Grave 30 displays evidence of a possible chronic sinus infection with small 2-5mm patches of woven bone within an enlarged frontal sinus cavity in two fragments (Figure 3.36). The highly fragmentary nature of the bones makes it impossible to assess the extent of the lesion. The infant in Grave 34 displays a possible periosteal hematoma, with woven bone as well as porosity on a fragment of left parietal, near the saggital-lambdoidal suture junction (Figure 3.37). Post-mortem damage and fragmentation makes the extent difficult to assess. Finally, the child in Grave 46 displays a large apical abscess (6.3mm wide) at the root of the left deciduous second molar in the mandible. The developing second permanent premolar is missing from beneath the tooth (Figure 3.38).

Figure 3.36: (Left) Frontal bone (ectocranial view) with enlarged frontal sinus and arrows indicating woven bone from Grave 30.

Figure 3.37: (Left)
Parietal fragment displays porosity and woven bone (ectocranial view) as indicated by the arrows from Grave 34.

Figure 3.38: (Right)
Large apical abscess in left mandible below the deciduous left second molar, (buccal view) the arrow indicates the missing premolar in the crypt from Grave 46.

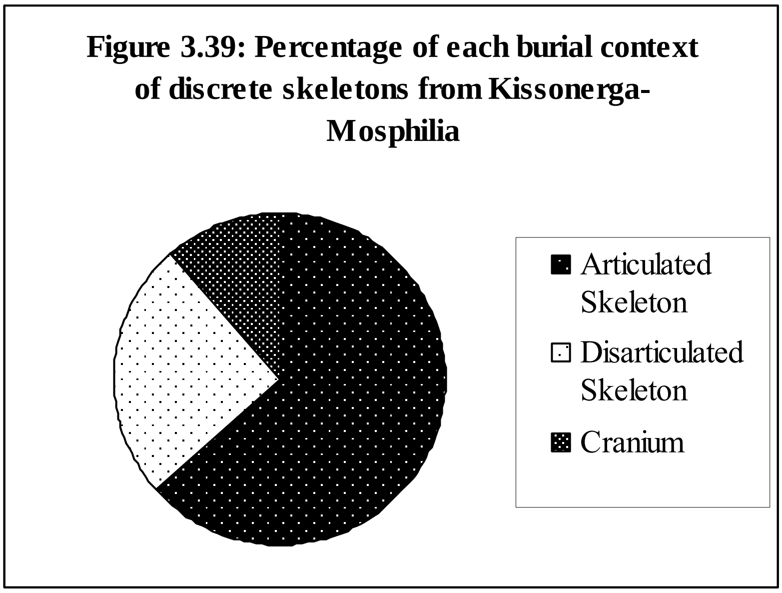


3.1.3 Kissonerga-Mosphilia

Of the minimum number of individuals from Kissonerga-*Mosphilia* (n=80), 88.8% (n=71) are represented by some form of discrete skeletal remains (Table 3.32 and Figure 3.39). The rest of the individuals are commingled within the graves and typically only represented by a small portion of the skeleton.

Table 3.32: Percentage of different burial contexts of discrete individuals from Kissonerga-*Mosphilia*

Type of burial	**Count**	**Percent**
Articulated Skeleton	45	63.3
Disarticulated Skeleton	18	25.4
Cranium	8	11.3
Total	71	100.0



The age distribution of discrete individuals derived from Kissonerga-*Mosphilia* is provided in Table 3.33 (and Figure 3.40). The greatest proportion of the discrete individuals are infants (with a median age between 0-2 years at death). However, there is a more even distribution at Kissonerga-*Mosphilia* than the other two sites as the percentages of children and young adults within the population are close behind that of infants. Table 3.34 (and Figure 3.41) presents the sex distribution across the site of the 24 adults or older adolescents. As with the other two sites, females outnumber males more than two-to-one. Overall, 57.7% (n=41) of the discrete individuals at Kissonerga-*Mosphilia* do not display any evidence of pathology.

Table 3.33: Age distribution of the discrete individuals at Kissonerga-*Mosphilia*

Age Groups	Count	Percent
Foetus	2	2.8
Infant	20	28.2
Child	19	26.8
Adolescent	5	7.0
Young adult	17	23.9
Adult	4	5.6
General adult	1	1.4
General subadult	3	4.2
Total	71	100.0

Figure 3.40: Percentage of discrete skeletons from each age group from Kissonerga-Mosphilia

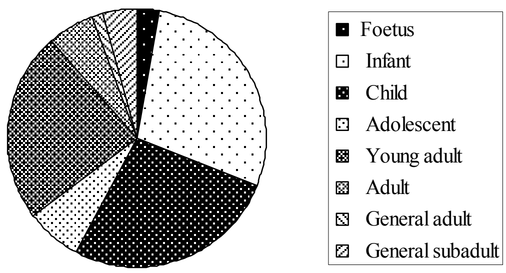
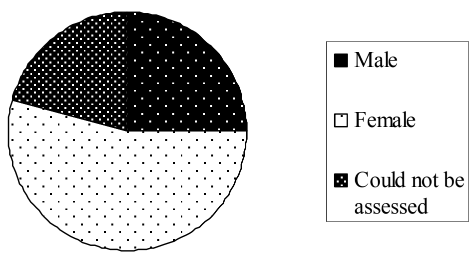


Table 3.34: Sex distribution of adult discrete individuals at Kissonerga-*Mosphilia*

Sex	Count	Percent
Male	6	25.0
Female	13	54.2
Could not be assessed	5	20.8
Total	24	100.0

Figure 3.41: Percentage of discrete skeletons by sex from Kissonerga-Mosphilia



3.1.3.1 Dental Disease

There are 65 individuals with teeth from Kissonerga-*Mosphilia* which will be included in this discussion, most of whom do not have complete sets of dentition for their respective age. Table 3.35 presents the percentage of each age group affected with a particular dental pathology and the overall totals. Calculus accumulation is the most common pathology observed. Within this group, most individuals display calculus on five or more teeth. Most of the individuals who display a carious lesion do so on only one tooth, however one individual displays caries on three teeth. There are two individuals who display one or more LEH on five or more teeth and two individuals with one or more LEH on at least four teeth, representing a general physiological stress as the teeth were forming.

Table 3.35: Percentage of each age group with dentition affected by a pathology

Age Category	Calculus	Caries	LEH	AMTL*	Attrition
Infant (n=20)	5.0	0.0	0.0	0.0	0.0
Child (n=19)	10.5	0.0	15.8	0.0	10.5
Adolescent (n=5)	60.0	0.0	40.0	0.0	0.0
Young Adult (n=16)	68.8	25.0	37.5	7.1	12.5
Adult (n=4)	50.0	25.0	25.0	100.0	75.0
General Adult (n=1)	0.0	0.0	0.0	0.0	0.0
Totals	29.2	7.7	18.5	4.1	10.8

* Ante-mortem tooth loss percentages do not include individuals who do not have either maxilla or mandibular fragments to assess.

Ante-mortem tooth loss was recorded for only two individuals from Kissonerga-*Mosphilia*, one of whom had lost at least seven teeth *in vivo*. While this represents the lowest frequency of ante-mortem tooth loss within the three sites, it is the most severe tooth loss within a single individual. Table 3.36 provides the percentages of individuals with either a maxilla and/or mandible for the assessment of ante-mortem tooth loss.

Table 3.36: Percentage of maxillae and mandibles present at Kissonerga-*Mosphilia*

Maxilla/Mandible	Count	Percent of total discrete individuals with teeth (i.e. recovery percentage)
CBA (no mandible/maxilla present)	16	24.6
Maxilla Present	38	58.5
Mandible Present	52	80.0

Most of the individuals recorded with teeth displaying severe attrition, have more than one tooth affected and in two cases, five or more of the teeth present were severely worn. As Table 3.34 illustrates, the infants and children display significantly less pathologies than those with an estimated older age. The older individuals display more *in vivo* tooth loss, as the teeth are in use longer with more opportunity to be lost. That 100.0% of 'general' adults displaying ante-mortem tooth loss is inflated results from the fact that three of the four individuals present did not have maxillary or mandibular bones present. Levels of attrition get progressively higher with the age of the individual, as 50.0% of those with an estimated age between 36-50 years at death ('adult') display severe attrition on five or more of the teeth examined. The difference in expression of calculus amongst the age groups is statistically significant, with older individuals displaying calculus more frequently[18].

Table 3.37 reflects the distribution of dental pathologies based on the sex assessment of adults and older adolescents. Overall, distribution of pathologies is quite similar between males and females, other than in regards to calculus and ante-mortem tooth loss. There is no statistically significant difference between the sexes and the appearance of dental disease (Chi Squared p=0.138).

Table 3.37: Percentage of each sex which are affected by a dental pathology from Kissonerga-*Mosphilia*

Sex Determination	**Calculus**	**Caries**	**LEH**	**AMTL***	**Attrition**
Male (n=5)	80.0	20.0	40.0	0.0	0.0
Female (n=13)	46.2	23.1	30.8	20.0	30.8
CBA (n=5)	100.0	20.0	40.0	0.0	20.0

* Ante-mortem tooth loss percentages do not include individuals who do not have either maxilla or mandibular fragments to assess.

Interestingly, despite having a lower percentage of individuals affected with LEH, females tend to have more than one tooth affected, while males have one or two teeth affected. In general there is a very different prevalence of LEH between males and females at Kissonergo-*Mosphilia*. Attrition seems to only effect females, which is possibly due to the fact that all five males examined are young adults and are perhaps not old enough to have worn their teeth down significantly. The difference in expression of calculus between the sexes does not prove to be statistically significant. Ante-mortem tooth loss also seems to effect females only, which again may be attributed to the younger ages of the males. There are two females which display ante-mortem tooth loss. The female from Grave 571 has lost at least seven teeth *in vivo* (see the individual description in Appendix H for a list of the lost teeth) most likely

[18] Several of the other disease groups display statistically significant differences in expression based on age at Kissonerga-*Mosphilia*, however with an assumption that makes the result unreliable as so many of the data cells are zero. However, it does confirm the statement that the expression of dental disease does get progressively more frequent based on age.

due to severe dental disease and osteomyelitis in both the maxillae and mandible (Figure 3.42). The young adult female from Grave 545 is missing the left first mandibular molar with active porous bone resorption on the site at the time of death (Figure 3.43).

Figure 3.42: The maxillae (view of the palate and lingual side of the teeth) and mandible (occlusal view) of the individual from Grave 571 displaying antemortem tooth loss and heavy attrition on the anterior teeth (note – the photo below is a composite and the two photos were taken at different scales which are displayed below). The abscessing and osteomyelitis can be seen in Figure 2.15.

Figure 3.43: (Left) Ante-mortem tooth loss of the left first mandibular molar as indicated by the arrow (occlusal view) from Grave545.

3.1.3.2 Osteoarthritic Changes

Osteoarthritic changes on the postcranial bones were assessed for 63 discrete skeletons at Kissonerga-*Mosphilia*. Table 3.38 (and Figure 3.44) presents the levels of completeness for discrete skeletons with postcranial bone. Table 3.39 provides the age distribution of the discrete skeletons with postcranial bone. The largest demographic groups are ‘young adults’ and ‘infants’, however just over half the population is under the age of 12 years at the time of death.

Table 3.38: Completeness levels of the discrete skeletons with postcranial material from Kissonerga-*Mosphilia*

Percent of Skeleton Present	**Count of Individuals**	**Percent of Individuals**
1-15	17	27.0
16-50	21	33.3
<50	25	39.7
Total	63	100.0

Figure 3.44: Percentage of discrete skeletons by the percentage of the skeleton present at Kissonerga-Mosphilia

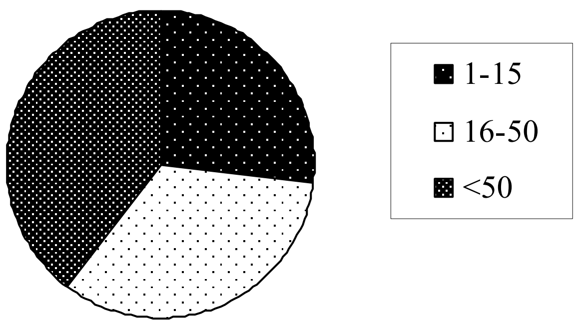


Table 3.39: Age distribution of the discrete skeletons with postcranial material from Kissonerga-*Mosphilia*

Age Groups	**Count**	**Percent**
Foetus	2	3.2
Infant	17	27.0
Child	15	23.8
Adolescent	5	7.9
Young adult	17	27.0
Adult	3	4.8
General adult	1	1.6
General subadult	3	4.8
Total	63	100.0

None of the 37 children or infants examined, display evidence of osteoarthritic changes and are unlikely to due to the relationship between older age and increased osteoarthritic changes (Gignac *et al.* 2006). Therefore, 26 individuals (with an estimated age over 12 years at death) are included in the analysis of postcranial osteoarthritic changes at Kissonerga-*Mosphilia*. As Table 3.40 illustrates, the majority of the adult or adolescent discrete individuals with postcranial material at Kissonerga-*Mosphilia* could be assessed for osteoarthritic changes and do not display degeneration of the preserved joints. However, preservation is quite poor and in some cases an individual only had one articular surface present from the entire skeleton.

Table 3.40: Percentage of discrete individuals with osteoarthritic changes

Preservation and osteoarthritic changes	Count	Percent
One or more body part with osteoarthritic changes	11	42.3
No osteoarthritic changes on preserved joints	13	50.0
No joints preserved	2	7.7
Total	26	100.0

Table 3.41 (and Figure 3.45) shows the joints which were assessed and the percentage of individuals with that particular joint present which were affected by osteoarthritic changes. The bones of the feet are the most frequently affected body part of the individuals. With regard to preservation of the joints, the knee is the most poorly preserved. None of the articular surfaces of the knee, elbow or hip joints displayed any osteoarthritic changes. Table 3.42 presents the number of particular surviving body parts/joints for all 26 of the discrete individuals and the percent of those body parts/joints which display osteoarthritic changes from Kissonerga-*Mosphilia*. The preservation of the hand is better when each body part is accounted for, indicating that many individuals had bilateral survival of at least one articular surface of a hand bone.

Table 3.41: Percentage of individuals with osteoarthritic changes to a specific joint

Joint	Count Present	Count with OA changes	Percent of individuals with OA changes	Number of Individuals with Osteoarthritic changes and nature of expression
Vertebrae	23	5	21.7	1 – atlas 2 – axis 2 – more than one vertebral group
Ribs	22	2	9.1	2 individuals
Feet	16	7	43.8	6 – unilaterally 1 – bilaterally
Elbow	12	0	0.0	No pathology
Ankle	13	1	7.7	1 – unilaterally
Hand	20	1	5.0	1 – unilaterally
Shoulder	16	1	6.3	1 – unilaterally
Wrist	14	2	14.3	2 – unilaterally
Hip	14	0	0.0	No pathology
Knee	11	0	0.0	No pathology

Figure 3.45: Percentage of discrete individuals with osteoarthritic changes to a specific joint

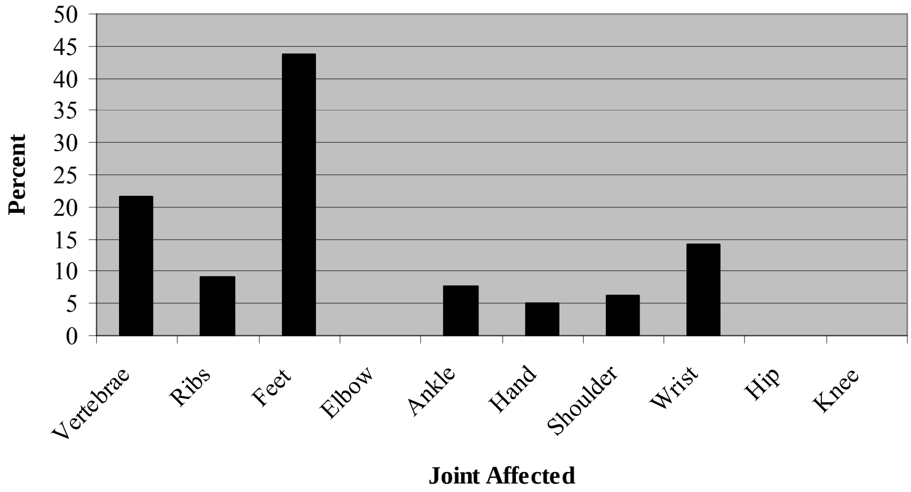


Table 3.42: Percentage of body parts of discrete individuals with osteoarthritic changes for Kissonerga-*Mosphilia**

Body Part	**Count of body parts present**	**Count with body parts with OA changes**	**Percent of body parts with OA changes**
Feet	28	8	28.6
Elbow	19	0	0.0
Ankle	23	1	4.3
Hand	30	1	3.3
Shoulder	26	1	3.8
Wrist	21	2	9.5
Hip	12	0	0.0
Knee	16	0	0.0

*The vertebrae and ribs are not included within this table as they were analysed on a discrete individual basis.

In regards to osteoarthritic expression based on age groups, analysis was based on four age groups (Table 3.43).

Table 3.43: Osteoarthritic changes based on age groups from Kissonerga-*Mosphilia*

Age Group	**Count with OA changes**	**Percent**	**Context Reference for Individuals with OA**
Adolescent (n=5)	2	40.0	Grave 505 Skeleton A Grave 535
Young Adult (n=17)	7	41.2	Grave 505 Skeleton C Grave 506 Grave 515 Skeleton A Grave 526 Skeleton A Grave 539 Skeleton South Grave 559 Grave 561

Age Group	Count with OA changes	Percent	Context Reference for Individuals with OA
Adult (n=3)	1	33.3	Grave 571
General Adult (n=1)	1	100.0	Grave 505 Skeleton B
Total	11	42.3	

The adolescent in Grave 535 displays osteophytic growth at the atlas in the form of osteophytic growth on the left inferior facet with some extension of the facet (Figure 3.46). Skeleton A within Grave 505, an older adolescent, displays osteophytic growth on the anterior margins of the bodies and inferior articular facets of several thoracic and the inferior articular facets of several lumbar vertebrae, as well as extension of the lateral condyle of distal epiphysis of the left first metatarsal (Figure 3.47 and Figure 2.8). Skeleton B from Grave 505, a female 'general adult', displays osteoarthritic changes to the axis with slight extension of the anterior aspect of the inferior body margin only 1mm or less and the distal epiphysis of the left ulna exhibits slight osteophytic growth on the anterior side (Figure 3.48). The female from Grave 571 discussed above with severe dental disease, also displays osteoarthritic changes to all vertebral groups with osteophytic growth on the margins of the bodies and extension of the articular facets; the distal epiphysis palmar side of the right first metacarpal displays extension of the condyle and the proximal epiphysis of a first proximal hand phalanx displays osteophytic growth; and a proximal and two intermediate foot phalanges present osteophytic growth at the margins of the proximal epiphyses and thickened diaphysis (Figure 3.49).

Figure 3.46: (Below left) Osteophytic growth on the margin of the left inferior articular facet of the atlas indicated by the arrow (inferior view) from Grave 535.

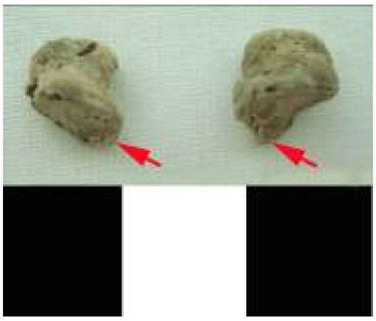
Figure 3.47: (Below centre) Bone growth extending on the lateral facet, dorsal aspect, indicated by the arrow, of the left first metatarsal (lateral view) from Grave 505 Skeleton A.

Figure 3.48: (Below right) Osteophytic growth on the margins of the articular surface of the distal epiphysis, anterior margin of a left ulna (distal-anterior view) from Grave 505 Skeleton B.

Figure 3.49: (Below left) Two intermediate foot phalanges with osteophytic growth on proximal epiphyses indicated by arrows and thickened diaphyses (plantar view) from Grave 571.

Figure 3.50: (Below centre) Axis displaying mild osteophytic growth on the dens as indicated by the arrow (posterior view) from Grave 526 Skeleton A.

Figure 3.51: (Below right) Proximal foot phalanx with remodelled distal epiphysis as indicated by the arrow (plantar view) from Grave 539 Skeleton South.



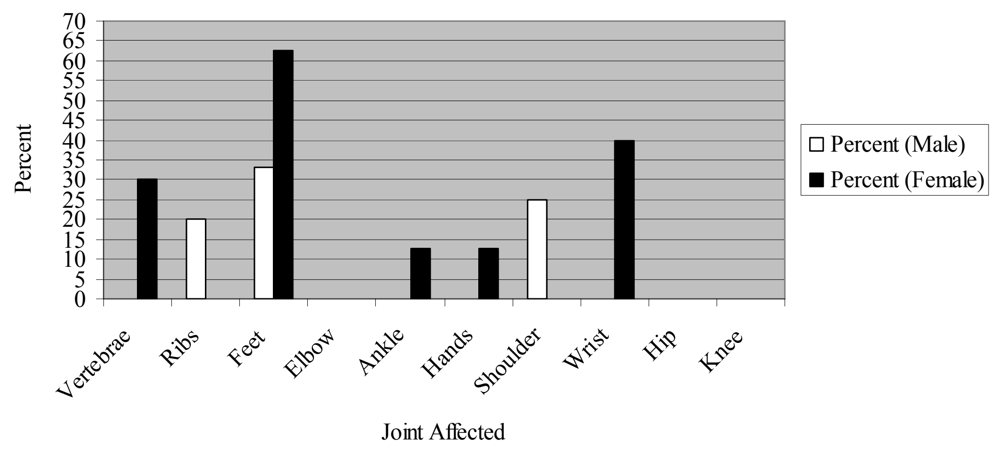
The 'young adults' which display osteoarthritic changes do so on a wider variety of joints than the other groups (see the individual descriptions for more detail – Appendix H). All osteoarthritic changes to the ribs, ankles and shoulders affect individuals within the young adult age group. Most of the individuals (five of seven) who display a degenerative change do so on only one joint. However, Skeleton A from Grave 526, a female, displays minor degenerative changes on four joints; the axis with a 2 mm osteophyte on the superior aspect; the left wrist with remodelling of the proximal articular facet of the trapezoid; the right foot with mild extension of the distal epiphysis, lateral side, dorsal aspect; and the right ankle with remodelling of the tubercle of the navicular and the formation of a new facet on the inferior aspect of the tubercle (Figure 3.50). Skeleton South from Grave 539, a young adult male, displays osteoarthritic changes on the left scapula in the form of extension of lateral end of acromion process with woven bone and small osteophyte on medial end of coracoid on the posterior side; and a proximal foot phalanx in the form of a remodelled distal epiphysis and mild bone growth at that articular surface (Figure 3.51).

Table 3.44 (and Figure 3.52) presents a joint by joint comparison of the percentage of individuals affected with osteoarthritic changes based on sex assessment. Other than with the feet, there is split in joints affected with osteoarthritic changes between males and females at Kissonerga-*Mosphilia*. Males display osteoarthritic changes to the ribs and shoulder, while females display osteoarthritic changes to the vertebrae, ankle, hand and wrist. The differences in distribution of osteoarthritic changes based on sex overall, are not statistically significant (Chi-Squared p=0.953)[19].

Table 3.44: Percentage of individuals with osteoarthritic changes by joint and sex

Joint	**Male - No. Affected/No. Present**	**Percentage (Male)**	**Female No. Affected/No. Present**	**Percentage (Female)**
Vertebrae	0/5	0.0	3/10	30.0
Ribs	1/5	20.0	0/10	0.0
Feet	1/3	33.3	5/8	62.5
Elbow	0/2	0.0	0/6	0.0
Ankle	0/2	0.0	1/8	12.5
Hands	0/5	0.0	1/8	12.5
Shoulder	1/4	25.0	0/9	0.0
Wrist	0/3	0.0	2/5	40.0
Hip	0/2	0.0	0/3	0.0
Knee	0/2	0.0	0/4	0.0

Figure 3.52: Percentage of each sex with osteoarthritic changes on a specific joint



3.1.3.3 Trauma

Of the 71 discrete individuals examined from Kissonerga-*Mosphilia*, only one individual displays evidence of trauma to the skeleton. The female individual from Grave 506, aged 18-26 years at death, displays an ankylosed intermediate and distal foot phalanx (Figure 3.53). While recorded as trauma for this study it is also possible that if these bones represent the fifth ray, the ankylosing could reflect a congenital

[19] While there is some variation in the p-values across the different joints – none of the results are statistically significant.

trait (known as symphalangism which often occurs bilaterally – Steinberg and Reynolds 1948). However, as no attempt was made to number the phalanges, until a radiograph proves otherwise, these are recorded as possible cases of trauma, though congenital defect cannot be ruled out. Therefore, only 1.4% of the discrete skeletons at Kissonerga-*Mosphilia* display evidence of trauma. Recovery and preservation of the skeletons at Kissonerga-*Mosphilia* has likely affected the frequency of trauma expression.

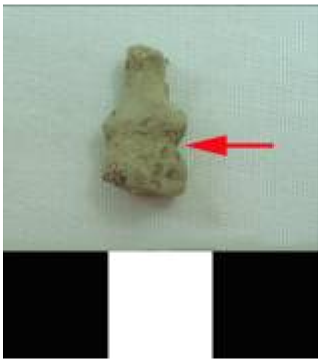


Figure 3.53: (Left) Ankylosed intermediate and distal foot phalanges with arrow indicating fused joint (dorsal view) from Grave 506.

3.1.3.4 Disease or Disorder or other pathological expression

Table 3.45 presents the percentage of each age group with evidence of a disease or disorder. The infant from Grave 551 and the child from Grave 566 show patches of mild and moderate porosity, respectively, in the frontal orbits, which may be cribra orbitalia, particularly on the superior aspects. Post-mortem damage makes the extent of the porosity difficult to assess (Figure 3.54). The infants from Graves 549 and 563 Skeleton B display small patches of porosity, possibly porotic hyperstosis, of the ectocranial surface of the parietals (Figure 3.55). The other child from Grave 567 and the adolescent from Grave 532 both display patches of porosity of the frontal orbits, as well as bowing of the diaphysis of the right radius and left and right femora, respectively, which possibly reflects cortical thinning of the bone (Figure 3.56). The femora from Grave 532, both bow laterally in the proximal third of the diaphysis and display small (2-4mm) lesions just laterally of the pectineal line in the proximal third of the bone.

Table 3.45: Percentage of individuals with evidence of disease or disorder by age from Kissonerga-*Mosphilia*

Demographic Group	**Count with evidence of disease**	**Percent with evidence of disease**	**Context references**
Foetus	0	0.0	
Infant	3	15.0	Grave 551 Grave 563 Skeleton B Grave 549
Child	2	10.5	Grave 566 Grave 567
Adolescent	1	20.0	Grave 532
Young Adult	0	0.0	
Adult	0	0.0	
General Adult	0	0.0	
Total	6	8.5	

Figure 3.54: (Below left) Close up detail of the right frontal orbit with arrow indicating porosity in the superior aspect of the orbit (anterior view, superior aspect is inferior) from the infant in Grave 551.

Figure 3.55: (Below right) Porosity on the ectocranial aspect near the lambdoidal suture of several parietal fragments, as indicated by the arrows from the infant in Grave 549.

Figure 3.56: (Below left) Right radius of a child from Grave 567 with lateral bowing of the middle of the diaphysis (anterior view).

Figure 3.57: (Below centre) Right humerus of a child from Grave 563 Skeleton A with a very small bone growth on the anterior side of the diaphysis, distal third as indicated by the arrow, also note the possible flaring of the metaphyses (anterior view).

Figure 3.58: (Below right) Maxilla with alveolar resorption as viewed from the left side, posterior teeth, buccal view from Grave 561.

Other pathologies which do not fall into the above categories were observed on six of the 71 (8.5%) discrete skeletons from the Kissonerga-*Mosphilia* sample. Skeleton A from Grave 563, a child, displays bone growth, approximately 2mm long on the anterior aspect in the distal third of the right humerus and possible flaring of the metaphyses which may represent a possible hematopoietic disease (Figure 3.57). The female young adult from Grave 561 displays alveolar resorption of the maxilla, particularly noted on the left molariforms (Figure 3.58). The young adult male from Grave 574 displays an unusual bone growth, 11.1x9.95x1.5mm, on the ectocranial side of the occipital, superior of the occipital protuberance. This may be a small osteoma or a non-pathological non-metric trait however no aetiology is currently conclusive (Figure 3.59). Apical abscesses were observed for three individuals: the young adult of unknown sex, Skeleton C Grave 505, displays an apical abscess in the maxilla at the root end of the lateral right incisor, however post-mortem damage makes the extent impossible to assess; the young adult female from Grave 546 displays an 8.8 mm apical abscess in the mandible at the root end of the right first molar (Figure 3.60); and finally the adult female from Grave 571 who displays severe chronic infections of the maxilla and mandible and over eruption of several teeth where ante-mortem tooth loss has deprived the tooth of its occluding partner (see Figures 2.15 and 3.42).

Figure 3.59: (Below left) Occipital bone from Grave 574 (ectocranial view) with superior Nuchal line from the right side, arrow indicates bone growth.

Figure 3.60: (Below right) Right mandible fragment from Grave 546 displays an apical abscess at the first molar as indicated by the arrow. A second arrow indicates the heavy attrition on the crown which may have affected the pulp chamber (buccal view of mandible).

<u>3.1.4 Comparison of the three sites</u>

When comparing the discrete individuals derived from Souskiou-*Laona*, Lemba-*Lakkous* and Kissonerga-*Mosphilia*, the first obvious difference is in the demographic distribution. In general the population from Souskiou-*Laona* has a higher age at death with young adults forming the largest age group within this study. The populations from the two settlement sites are predominately under the age of 12 years at death. However, Kissonerga-*Mosphilia* has a slightly more even age distribution. The sample of adults and older adolescents for whom sex could be assessed is much larger from Souskiou-*Laona* (n=85), while Lemba-*Lakkous* (n=19) and Kissonerga-*Mosphilia* (n=24) are slightly more comparable. Despite this the distribution of males and females is relatively similar across all three sites, with a higher percentage of the adult population assessed as female. All three sites also have a similar percentage of individuals who did not display any evidence of pathology, ranging from 57.0-63.0%.

There is no statistically significant difference between pathological expression between the sites (Chi Squared p=0.879).

3.1.4.1 Dental Disease

The results from all three sites indicate that the expression of dental disease increases in correlation with age. When the three sites are compared based on the number of individuals of each age group displaying a particular dental defect, most age groups do not display a statistically significant difference (Table 3.46).

Table 3.46: P-values for each age group for the differences in expression of each dental pathology across all three sites

Age Group	**Caries**	**Calculus**	**LEH**	**AMTL**	**Attrition**
Infant	0.444	0.660	0.406	0.769	N/A
Child	0.100	0.392	0.251	0.706	0.545
Adolescent	0.048	0.010	0.383	0.493	N/A
Young Adult	0.099	0.032	0.569	0.221	0.049
Adult	0.489	0.287	0.263	0.072	0.060
General Adult	0.084	N/A	N/A	0.382	0.225

Those aged as ‘adults’ do not display any significant difference in expression amongst the sites, however, ante-mortem tooth loss is more frequent at Kissonerga-*Mosphilia* while attrition is particularly high amongst the adults at Lemba-*Lakkous*. Despite not being significantly different, the ‘adult’ individuals do not display any LEH at Souskiou-*Laona*, while 25% of the ‘adults’ at Lemba-*Lakkous* and 25% of those from Kissonerga-*Mosphilia* have at least one tooth with at least one LEH present which may indicate that those with LEH were dying at a younger age at Souskiou-*Laona* or that LEH was generally less prevalent amongst the cemetery skeletal sample.

Within the ‘young adult’ age group, the expression of calculus and heavy attrition is significantly different amongst the sites. The discrete individuals aged as ‘young adults’ from Kissonerga-*Mosphilia* display significantly more calculus than those at Lemba-*Lakkous* or Souskiou-*Laona*. This relationship is not particularly strong however (Cramers V = 38.3%). More ‘young adult’ individuals at Souskiou-*Laona* display particularly heavy attrition than the other two sites, though again it is a very weak association (Cramers V =34.1%).

Within the ‘adolescents’ age group across the three sites, there are statistically significant differences amongst expression of calculus and caries. Once again, the adolescent individuals at Kissonerga-*Mosphilia* display more calculus with a fairly strong relationship (Cramers V =64.8%). The difference amongst the sites in regards to caries amongst adolescents indicates a weak relationship (Cramers V=31.6%) with 30.0% of Souskiou-*Laona* adolescents displaying the lesion, 40.0% of Lemba-*Lakkous* adolescents and no adolescents from Kissonerga-*Mosphilia* (Chi Squared p=0.048).

Table 3.47 presents the statistical significance values for the different sexes for the different dental pathologies. When analysed based on each separate pathology, males and those without an assessed sex have a statistically significant difference across the three sites in the expression of individuals with calculus accumulation. The male and un-sexed individuals from Kissonerga-*Mosphilia* display the highest frequency of calculus on at least one tooth, which is reflected in studies of calculus prevalence in modern populations (i.e. Beiswanger *et al.* 1989; White 1991). Males also display a statistically significant difference of ante-mortem tooth loss and heavy attrition across the three sites with Lemba-*Lakkous* displaying the highest frequency of both defects. Females display a statistically significant difference of heavy attrition across the three sites despite all sites having a relatively similar frequency of expression.

Table 3.47: P-values for each sex for the differences in expression of each dental pathology across all three sites

Sex	**Caries**	**Calculus**	**LEH**	**AMTL**	**Attrition**
Male	0.754	0.015	0.242	0.020	0.017
Female	0.395	0.533	0.615	0.272	0.002
Could not be assessed	0.203	0.001	0.183	0.119	0.341

There is no statistically significant difference in expression of any singular dental pathology between males and females. Table 3.48 provides the P-values to illustrate that despite the differences in pathological expression between the sexes, when combined, there is no significant difference.

Table 3.48: P-values for the differences between males and females based on dental pathology

	Caries	**Calculus**	**LEH**	**AMTL**	**Attrition**
P-value	0.494	0.838	0.773	0.147	0.622

Of all the discrete individuals from all three sites, 38.4% display some form of dental disease. Table 3.49 presents the percentage of individuals from each site who display some form of dental disease. Overall, there is a statistically significant difference amongst the sites in regards to expression of dental disease, as Souskiou-*Laona* represents 50% of all dental disease at all three sites (Chi Squared p=0.020). However, the relationship between the expression of dental disease and the site is very weak (Cramers V = 17.2%).

Table 3.49: Percentage of individuals with dental pathology across the three sites

Site Name		**Dental Disease Present?**			**Total**
		No	**Yes**	**CBA**	
Souskiou-*Laona*	Count	46	38	0	84
	% of dental disease	38.7%	50.0%	0.0%	42.4%
Lemba-*Lakkous*	Count	30	16	3	49
	% of dental disease	25.2%	21.1%	100.0%	24.7%
Kissonerga-*Mosphilia*	Count	43	22	0	65
	% of dental disease	36.1%	28.9%	0.0%	32.8%
Total	Count	119	76	3	198
	% of total	60.1%	38.4%	1.5%	100.0%

3.1.4.2 Osteoarthritic Changes

Infants and children have not been included within this discussion. Therefore there are 75 adults or older adolescents analysed. There is no statistically significant difference in the frequency of osteoarthritic changes across the three sites (Chi Squared p=0.542), however there is a variation in osteoarthritic expression in terms of severity and location on the body. The individuals from Souskiou-*Laona* display a wider variety of joints affected by osteoarthritic changes, while those derived from Lemba-*Lakkous* and Kissonerga-*Mosphilia* have joint groups which do not display any evidence of osteoarthritic changes. Individuals from Souskiou-*Laona* display the highest prevalence of osteoarthritic changes on the elbows, ankles, hands, hips and knees. Individuals from Lemba-*Lakkous* display the highest prevalence of osteoarthritic changes to the vertebrae, shoulders and wrists, while those from Kissonerga-*Mosphilia* display the highest prevalence of osteoarthritic changes to the ribs and feet. Despite these variations in expression, there is no statistically significant difference amongst the sites based on the joint affected with the pathology[20].

There is no statistically significant difference in the expression of osteoarthritic changes across the three sites based on sex (Chi Squared p=0.552 for males and p=0.435 for females). There is no statistically significant difference between the expression of osteoarthritic changes on a particular joint and the individuals of a particular sex. For example, there is no statistically significant difference in the observation of osteoarthritic changes of the wrist for all females across the three sites (Chi Squared p=0.732). Females and males do differ in the specific joints or body parts which are affected by osteoarthritic changes. This does not prove to be statistically significant overall (Chi Squared p=0.748). However, there is a statistically significant difference in the prevalence of ribs and shoulder joints of males, females and un-sexed individuals which display osteoarthritic changes (Chi Squared p=0.035 and p=0.002 respectively). In both cases, males display significantly more osteoarthritic changes to the articular facets of the ribs and bones of the shoulder (consisting of the proximal epiphysis of the humerus, the glenoid fossa, the acromion process and the acromial end of the clavicle) than females or un-sexed individuals. While generally not statistically significant, it is interesting to note the apparent groupings of pathological expression by sex.

While both sexes display osteoarthritic changes to the feet, females do so with much greater frequency. Overall, 33.4% of females at all sites display osteoarthritic changes to at least one bone in the foot, while only 11.8% of all males do so. The disparity is particularly noticeable at Souskiou-*Laona* and Lemba-*Lakkous* where almost half the females observed display some form of osteoarthritic change to the foot, while over half of the females at Kissonerga-*Mosphilia* do so. Osteoarthritic changes to the shoulder seem to be a solely male phenomenon, particularly noted at Lemba-*Lakkous* where 50% of the male individuals present display bilateral osteoarthritic changes to the shoulder. Osteoarthritic changes to the wrist were observed in at least two females from each site and no males. Females from Souskiou-*Laona*, in general, display more

[20] Chi Squared tests for all joint groups comparing the three sites - Vertebrae p=0.160; Ribs p=0.795; Feet p=0.771; Elbow p=0.466; Ankle p=0.666; Hand p=0.227; Shoulder p=0.236; Wrist p=0.530; Hip p=0.788; Knee p=0.117

variety in the joints affected by osteoarthritic changes. Only females from Souskiou-*Laona* display osteoarthritic changes to the articular surfaces of the hip and knee, and only females from Souskiou-*Laona* and Kissonerga-*Mosphilia* display osteoarthritic change to the ankles (this does not necessarily seem to reflect squatting, which creates particular facets on the tarsals – i.e. Boulle 2001; Molleson 2007: 187). In summary, both sexes display comparable osteoarthritic changes of the vertebrae, elbows and hands. There is a difference in the frequency of expression of osteoarthritic changes in regards to the ribs, feet, ankle, shoulder and wrist. And while only the Souskiou-*Laona* females display osteoarthritic changes to the hips and knees, this does not prove to be statistically significant, most likely due to the very small sample size as these joints do not survive very well.

3.1.4.3 Trauma

There is no statistically significant difference amongst the three sites in regards to the observation of bones affected by an incidence of trauma (Chi Squared p=0.632). There is no statistically significant difference between the sexes or ages in regards to trauma. In general, only nine of the 231 individuals observed display evidence of trauma (3.9%). These are all young adults or adults, three males and six females. The severity of the trauma is higher at Souskiou-*Laona* where there are two long bone fractures, as there are none at Lemba-*Lakkous* or Kissonerga-*Mosphilia*.

3.1.4.4 Disease or Disorder or other pathological expression

There is no statistically significant difference in the observed expression of disease or disorder amongst the three sites in general nor amongst the different age groups or between males and females (Chi Squared p=0.282, p=0.605, p=0.430 respectively). Of all discrete individuals who display evidence of a disease or disorder, 64.6% are under the age of twenty years at death. Therefore, while not statistically significant, infants, children and adolescents represent the majority of discrete individuals with evidence of disease or a disorder observed (on the entire sample).

Other pathologies, which are not situated in the above groups include: alveolar resorption, dental abscesses, unusual bony lesions (typically non- active and most likely asymptomatic) and woven bone within the sinus cavity. These pathologies represent infrequent occurrences and are not conducive to comparison across sites, by sex determination or age estimation at this stage.

3.2 Palaeopathological Analyses By Skeletal Element

The pathologies affecting each skeletal element are presented below by skeletal element. A cross referenced chart is provided at the end of the section which presents the types of pathologies observed and lists which bone elements are affected. Further description and information about all the pathologies observed can be found in Appendices D-I with the burial and individual descriptions. These are presented by burial number and individual title. Table 3.50 and Figure 3.61 present the percentage of human remains from each site.

Table 3.50: Percentage of human remains from each site

Site	Percentage of Skeletal Sample
Souskiou-*Laona*	61.9
Lemba-*Lakkous*	14.6
Kissonerga-*Mosphilia*	23.5
Total	100.0

Figure 3.61: Percentage of human remains from each site

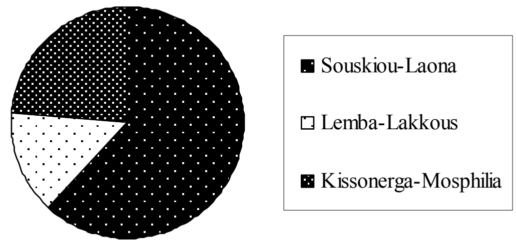


Table 3.51: Frequency of the different skeletal elements for all sites combined

Bone or Teeth	Frequency	Percent
Mandibular Dentition	2111	11.8%
Maxillary Dentition	2067	11.5%
Cranium	2067	11.5%
Hand Phalanx	1596	8.9%
Metatarsal	947	5.3%
Foot Phalanx	938	5.2%
Metacarpal	861	4.8%
Tarsal	700	3.9%
Ribs	650	3.6%
Indet bone	447	2.5%
Cervical Vertebra	430	2.4%
Femur	409	2.3%
Humerus	395	2.2%
Carpal	374	2.1%
Radius	360	2.0%
Tibia	348	1.9%
Ulna	342	1.9%
Scapula	338	1.9%
Os Coxa	328	1.8%
Clavicle	326	1.8%
Indet long bone	291	1.6%
Fibula	289	1.6%
Mandible	279	1.6%

Bone or Teeth	Frequency	Percent
Thoracic Vertebra	251	1.4%
Indet vertebra	207	1.2%
Lumbar Vertebra	137	0.8%
Indet dentition	119	0.7%
Patella	108	0.6%
Sacrum	70	0.4%
Indet phalanx	47	0.3%
Sesamoid bone	30	0.2%
Sternum	24	0.1%
Hyoid	20	0.1%
Auditory Ossicle	15	0.1%
Total	17921	100.0%

As is to be expected, the dentition and cranium are the most frequently occurring elements (an average adult cranium composed of 28 bones, each of which is treated as an individual element and the average adult has 32 teeth). Interestingly, foot phalanges are not as well represented as would be expected given the quantity of them within the body (28 per individual). Despite the fact that there are the same number of hand phalanges as foot phalanges within the body, the hand phalanges had approximately 600 more elements present. This may reflect burial practice and the secondary manipulation of the skeletal elements, excavation methodology (particularly in the case of the settlement sites), or possibly preservation differences as the foot phalanges are smaller.

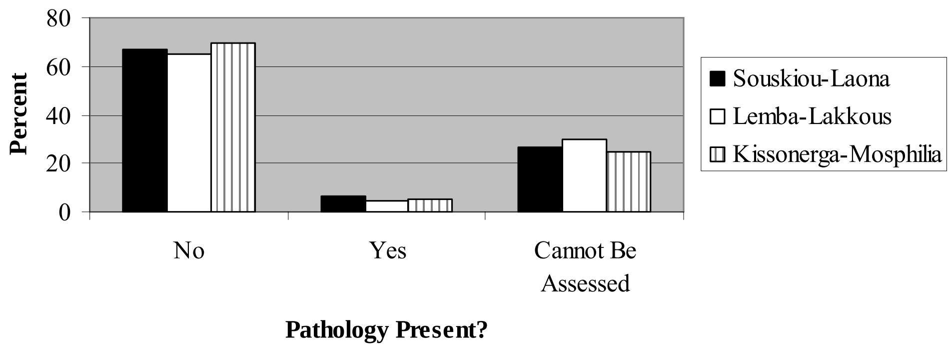
Table 3.52 (and Figure 3.62) presents the site by site expression of pathological lesions observed and the percentage of elements which could not be assessed for pathologies. The difference in proportion of pathological expression across the three sites is statistically significant (Chi Squared p=0.000, Cramer's V=3.2%). The skeletal series from Souskiou-*Laona* displays significantly more pathology than those from Lemba-*Lakkous* or Kissonerga-*Mosphilia*. There is no statistically significant difference in pathological expression between Lemba-*Lakkous* and Kissonerga-*Mosphilia*[21].

[21] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.000, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.021 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.293.

Table 3.52: Percentage of human remains with pathologies based on site

Site Name		Pathology Present? No	Yes	Cannot be assessed	Total
Souskiou-*Laona*	Count	7393	732	2960	11085
	% of Site	66.7%	6.6%	26.7%	100.0%
	% of Pathology?	61.4%	67.7%	61.7%	61.9%
Lemba-*Lakkous*	Count	1704	116	789	2609
	% of Site	65.3%	4.4%	30.2%	100.0%
	% of Pathology?	14.2%	10.7%	16.4%	14.6%
Kissonerga-*Mosphilia*	Count	2945	234	1048	4227
	% of Site	69.7%	5.5%	24.8%	100.0%
	% of Pathology?	24.4%	22.1%	21.8%	23.6%
Total	Count	12042	1082	4797	17921
	% of Site	67.2%	6.0%	26.8%	100.0%

Figure 3.62: Percentage of human remains from each site with pathology



3.2.1 Cranial Bones

3.2.1.1 Frontal

3.2.1.1.1 Souskiou-Laona

Two different possible pathologies were observed on three discrete adult frontal bones. Table 3.53 presents the frontal bones observed at Souskiou-*Laona* by age and the pathologies observed. Table 3.54 provides the different pathologies based on sex determination of the frontal from Souskiou-*Laona*.

Table 3.53: The frontal bones from Souskiou-*Laona* by age with the pathologies observed

Age Group	Count	Percent	Disease or disorder	Percent	Other pathology	Percent
Adult	99	89.2	2	2.0	1	1.0
Subadult	12	10.8	0	0.0	0	0.0
Total	111	100.0	2	1.8	1	0.9

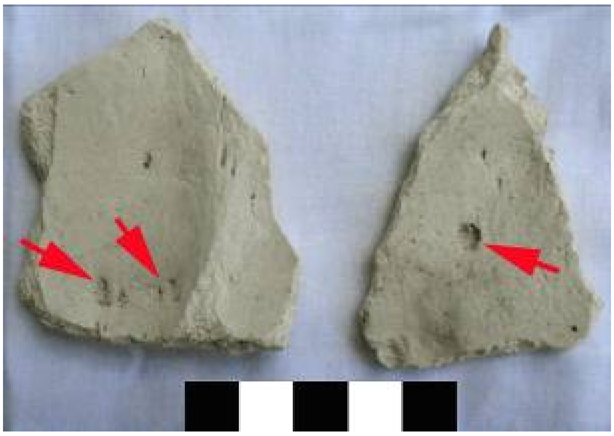
Table 3.54: The frontal bones from Souskiou-*Laona* by sex with the pathologies observed

Sex	Count	Percent	Disease or disorder	Percent	Other pathology	Percent
Male	22	22.2	0	0.0	1	4.5
Female	39	39.4	2	5.1	0	0.0
CBA	38	38.4	0	0.0	0	0.0
Total	99	100.0	2	1.0	1	0.9

The two females display porosity in the frontal orbits, possible cribra orbitalia, which may represent either a metabolic disorder, infectious or hematopoietic disease. Tomb 161 Cranium C shows mild porosity in the left orbit, but post-mortem damage makes it difficult to assess the extent. Tomb 165 Cranium A displays porosity in the right orbit, however once again post-mortem damage makes the extent impossible to assess (Figure 3.63). A male frontal from Tomb 228 bonestack exhibits small (c.4mm) non-active lesions on the endo-cranial side of the squama which may represent a localized infection, a metabolic disorder or possible soft tissue trauma resulting in some form of bony response (Figure 3.64). There is no statistically significant difference in pathological expression based on sex (Chi Squared p=0.611).

Figure 3.63: (Below left) Right frontal orbit with porosity in the superior aspect as indicated by the arrow from Tomb 165 Cranium A (anterior view, superior aspect is inferior).

Figure 3.64: (Below right) Small lesions indicated by the arrows, on the frontal squama from Tomb 228 Bonestack (endocranial view, inferior aspect is bottom).



3.2.1.1.2 Lemba-Lakkous

Two different possible pathologies were observed on five discrete frontal bones. Table 3.55 presents the frontal bones observed at Lemba-*Lakkous* by age and the pathologies observed. Table 3.56 provides the different pathologies based on sex determination of the frontal from Lemba-*Lakkous*.

Table 3.55: The frontal bones from Lemba-*Lakkous* by age with the pathologies observed

Age Group	**Count**	**Percent**	**Disease or disorder**	**Percent**	**Other pathology**	**Percent**
Adult	13	37.1	1	7.7	1	7.7
Subadult	22	62.9	3	13.6	0	0.0
Total	35	100.0	4	11.8	1	2.9

Table 3.56: The frontal bones from Lemba-*Lakkous* by sex with the pathologies observed

Sex	**Count**	**Percent**	**Disease or disorder**	**Percent**	**Other pathology**	**Percent**
Male	3	23.1	0	0.0	1	33.3
Female	9	69.2	1	11.1	0	0.0
CBA	1	7.7	0	0.0	0	0.0
Total	13	100.0	1	7.7	1	7.7

Three subadult frontals from Graves 13, 32 and 17, (two children and one infant respectively) display porosity on the superior aspects of the frontal orbits at varying levels of severity. These lesions may represent evidence of either a metabolic disorder, infectious or hematopoietic disease, however the extent of the lesion is difficult to assess due to post-mortem damage. The young adult female from Grave 50 displays patches of mild porosity on the superior aspects of both orbits (see Figure 3.35 above). The adult male from Grave 30, displays an expanded sinus frontal cavity with woven bone on the surfaces within possibly reflecting a sinus infection (see Figure 3.36 above). There is no statistically significant difference between pathological expression based on sex (Chi Squared p=0.223).

3.2.1.1.3 Kissonerga-Mosphilia

The frontal bones from Kissonerga-*Mosphilia* only display evidence of a possible disease or disorder on four subadult bones. Table 3.57 presents the frontal bones observed at Kissonerga-*Mosphilia* by age and the pathologies observed.

Table 3.57: The frontal bones from Kissonerga-*Mosphilia* by age with pathology

Age Group	**Count**	**Percent**	**Disease or disorder**	**Percent**
Adult	16	32.7	0	0.0
Subadult	33	67.3	4	12.1
Total	49	100.0	4	8.1

The four subadult frontal bones, from Graves 532, 551, 566, 567, display patches of porosity of the superior aspects of the frontal orbits to varying degrees. This porosity may represent evidence of a metabolic disorder, infectious or hematopoietic disease, or possibly scorbutic lesions associated with scurvy (i.e. Ortner *et al*. 2001). However, the extent of the porosity is difficult to assess due to post-mortem damage and confirmation on the aetiology requires further evidence (see Figure 3.54 for an example of porosity in the frontal orbits at Kissonerga-*Mosphilia* from Grave 551).

3.2.1.1.4 Comparison

Lemba-*Lakkous* displays the highest prevalence of pathology of the frontal bones representing a statistically significant difference between Lemba-*Lakkous* and Souskiou-*Laona* in regards to the expression of disease or disorder on the frontal bones (Table 3.58). There is no significant difference between Souskiou-*Laona* and Kissonerga-*Mosphilia* nor between Lemba-*Lakkous* and Kissonerga-*Mosphilia*[22]. No males display conclusive evidence of a disease or disorder. However, two male frontals do display pathological lesions, a possible sinus infection and lesions of unknown aetiology on the squama. There is no evidence of trauma, infection or congenital defects on any of the frontal bones examined.

Table 3.58: Percentage of adults and subadults with evidence of a disease or disorder to the frontal bone

Site	**% of males**	**% of females**	**% of adults**	**% of subadults**	**Totals**
Souskiou-*Laona*	0.0	5.1	2.0	0.0	1.8
Lemba-*Lakkous*	0.0	11.1	7.7	13.6	11.8
Kissonerga-*Mosphilia*	0.0	0.0	0.0	12.1	8.1
Totals	0.0	5.2	2.3	10.4	5.1

<u>*3.2.1.2 Maxilla*</u>

3.2.1.2.1 Souskiou-Laona

At least three different possible pathologies were observed on eleven discrete adult maxillae. Table 3.59 presents the maxillae observed at Souskiou-*Laona* by age and the pathologies observed. Table 3.60 provides the different pathologies based on sex determination of the maxillae from Souskiou-*Laona*.

[22] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.031, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.326 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.514.

Table 3.59: The maxillae from Souskiou-*Laona* by age with the pathologies observed

Age Group	Count	Percent	AMTL	Percent	Apical Abscess	Percent	Other pathology	Percent
Adult	93	93.9	9	9.7	1	1.1	1	1.1
Subadult	6	6.1	0	0.0	0	0.0	0	0.0
Total	99	100.0	9	9.1	1	1.0	1	1.0

Table 3.60: The maxillae from Souskiou-*Laona* by sex with the pathologies observed

Sex	Count	Percent	AMTL	Percent	Apical Abscess	Percent	Other pathology	Percent
Male	14	15.1	3	21.4	0	0.0	0	0.0
Female	32	34.4	2	6.3	0	0.0	1	3.1
CBA	47	50.5	4	8.5	1	2.1	0	0.0
Total	93	100.0	9	9.7	1	1.1	1	1.1

There is a statistically significant difference in expression of pathology of the maxillae between males and females at Souskiou-*Laona* (Chi Squared p=0.035, Cramer's V=32.3%). Ante-mortem tooth loss accounts for 81.8% of the pathologies affecting the maxillae. A total of 19 maxillary teeth were observed as lost *in vivo* from nine maxillae at Souskiou-*Laona*, representing an average of 2.1 teeth lost per maxilla. The left first molar is the most frequently lost tooth (n=5), followed closely by the right first molar (n=4). The right second molar and left second premolar were both lost by two individuals, while other teeth were lost in at least one individual (see below Figure 3.11). It is difficult to assess bilateral tooth loss (a sign of periodontal disease) based on the commingled nature and poor preservation of many of the maxillae. However, there are two recorded cases of bilateral loss of the first molars from Skeleton D, Tomb 200 and Cranium D, Tomb 165. The most severe case of tooth loss for the maxilla at Souskiou-*Laona* occurs on a maxilla from the bonestack of Tomb 200, where the individual lost

Figure 3.65: (Below) Ante-mortem tooth loss from a right maxilla fragment from Tomb 200 bonestack. Arrows indicate three different levels of alveolar resorption (occlusal view, lateral side is superior and anterior is right)

all the teeth from the right lateral incisor back to the right first molar (Figure 3.65). There is no conclusive evidence of congenitally absent teeth[23]. Radiographs are required to ascertain if teeth are congenitally absent.

Other than ante-mortem tooth loss, there is one case of a dental apical abscess and one case of alveolar resorption and porosity and remodelling within a sinus cavity. Cranium C Tomb 220 displays an apical abscess at the left first molar on the anterior-buccal side which is 8.8mm wide, smooth-sided and within which is porous (see Figure 3.19 above). Cranium C Tomb 192 displays alveolar resorption, most noticeable on the buccal side of the left molariforms, as well as, a patch (c.11mm diameter) of remodelled and porous bone within the left sinus cavity which may represent a possible chronic sinus infection (see Figure 3.18 above).

3.2.1.2.2 Lemba-Lakkous

Ante-mortem tooth loss is the only pathology observed on an adult maxillae. Table 3.61 presents the maxillae observed at Lemba-*Lakkous* by age and the pathologies observed. Table 3.62 provides the different pathologies based on sex assessment of the maxillae from Lemba-*Lakkous*.

Table 3.61: The maxillae from Lemba-*Lakkous* by age with the pathologies observed

Age Group	**Count**	**Percent**	**AMTL**	**Percent**
Adult	10	41.7	1	10.0
Subadult	14	58.3	0	0.0
Total	24	100.0	1	4.2

Table 3.62: The maxillae from Lemba-*Lakkous* by sex with the pathologies observed

Sex	**Count**	**Percent**	**AMTL**	**Percent**
Male	4	40.0	1	25.0
Female	5	50.0	0	0.0
CBA	1	10.0	0	0.0
Total	10	100.0	1	10.0

This maxilla is from the adult male in Grave 53 displays ante-mortem tooth loss of the left first molar (in very poor preservation). All the teeth from the right side were *in*

[23] For more information on the maxillae displaying ante-mortem tooth loss, see the individuals and tombs descriptions for Tomb 193 Skeleton E, Tomb 200 Cranium A, Tomb 200 Bonestack, Tomb165 Cranium A, Tomb 165 Cranium D, Tomb 193 Bonestack A Bone UU2, Tomb 200 Skeleton D and Tomb 228 looted commingled bone.

situ at death. There is no statistically significant difference in pathological expression on the maxillae from Lemba-*Lakkous* based on sex (Chi Squared p=0.157).

3.2.1.2.3 Kissonerga-Mosphilia

At least three different possible pathologies were observed on five discrete maxillae. Table 3.63 presents the maxillae observed at Kissonerga-*Mosphilia* by age and the pathologies observed. Table 3.64 provides the different pathologies based on sex determination of the maxillae from Kissonerga-*Mosphilia*.

Table 3.63: The maxillae from Kissonerga-*Mosphilia* by age with the pathologies observed

Age Group	**Count**	**Percent**	**AMTL**	**Percent**	**Apical Abscess**	**Percent**	**Alveolar Resorption**	**Percent**
Adult	20	47.6	1	5.0	2	10.0	2	10.0
Subadult	22	52.4	0	0.0	0	0.0	1	4.5
Total	42	100.0	1	2.4	2	4.8	3	7.1

Table 3.64: The maxillae from Kissonerga-*Mosphilia* by sex with the pathologies observed

Sex	**Count**	**Percent**	**AMTL**	**Percent**	**Apical Abscess**	**Percent**	**Alveolar Resorption**	**Percent**
Male	7	35.0	0	0.0	0	0.0	1	14.3
Female	9	45.0	1	11.1	1	11.1	1	11.1
CBA	4	20.0	0	0.0	1	25.0	0	0.0
Total	20	100.0	1	5.0	2	10.0	2	10.0

The subadult maxilla is from the young adolescent from Grave 535 who displays mild alveolar resorption, most clearly preserved on the left molariforms. There is a statistically significant difference in pathological expression on the maxilla based on assessed sex (Chi Squared p=0.019, Cramer's V=53.1%). Mild alveolar resorption is observed on the left molariforms, buccal side, of the young adult male from South Skeleton Grave 539 and the young adult female from Grave 561 (see above Figure 3.58). In regards to apical abscesses, the young adult Skeleton C from Grave 505 displays a small abscess at the end of the right lateral incisor root tip, but post-mortem damage makes the extent difficult to assess. The maxillae of the adult female from Grave 571 displays apical abscesses at the ends of the canine roots and ante-mortem tooth loss of all the posterior teeth of the maxillae with both the left and right first and second molars and premolars missing (see Figure 3.42 above and Figure 3.66).

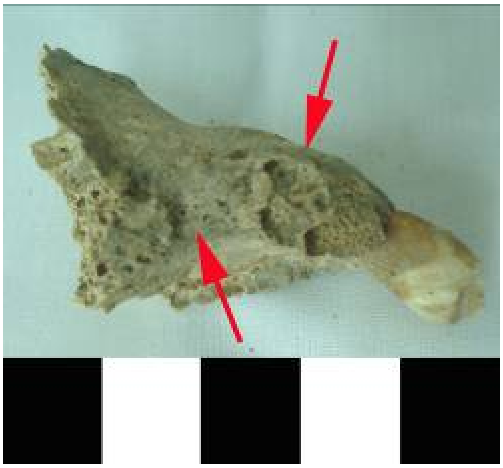


Figure 3.66: (Left) Right maxilla from Grave 571 displays ante-mortem tooth loss of both premolars and first and second molars as indicated by the arrows with active lesions on the alveoli (occlusal view, anterior is to the right and palate is inferior).

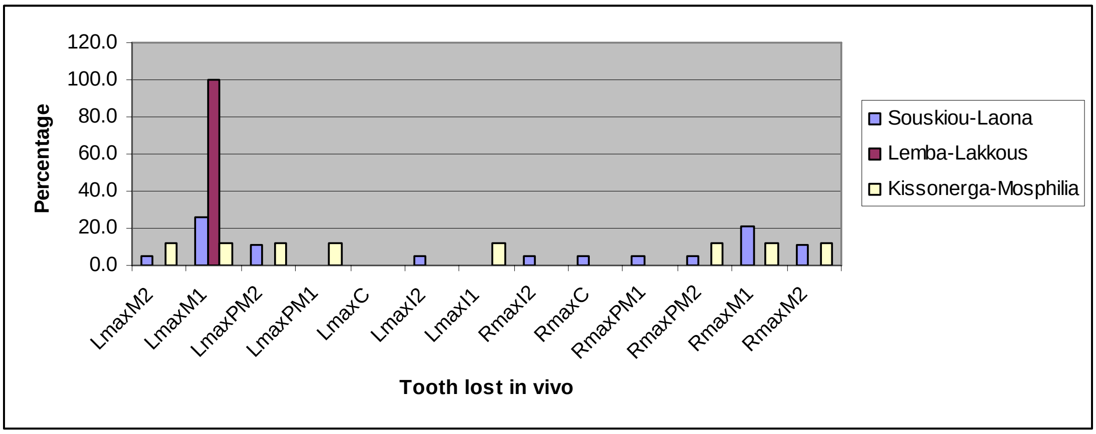
3.2.1.2.4 Comparison

There is no statistically significant difference in pathological expression on the maxillae amongst the three sites (Chi Squared p=0.371). Ante-mortem tooth loss, alveolar resorption and apical abscesses are the three most prevalent pathologies observed on the maxillae across all three collections. There is no evidence of metabolic, hematopoietic or infectious diseases or disorders, congenital pathologies or trauma on any of the maxillae observed. Overall, there is a statistically significant difference between pathological expression on the maxilla based on sex, with a higher percentage of males displaying pathology at Souskiou-*Laona* and Lemba-*Lakkous* (Chi Squared p=0.000, Cramer's V=38.1%). Alveolar resorption is most prevalent at Kissonerga-*Mosphilia*, while ante-mortem tooth loss is most prevalent at Souskiou-*Laona*.

It is difficult to discuss periodontal disease as it relates to ante-mortem tooth loss for this study as many of the maxillae were only partially present or fragmented. The bilateral loss of a particular maxillary tooth was observed in two cases at Souskiou-*Laona* and one case at Kissonerga-*Mosphilia*. There does not seem to be any direct evidence for the congenital evidence of teeth for any of the maxillae observed. It is perhaps more productive to look at the percentage of each tooth lost per site to observe any differences in expression (Figure 3.67). While there are more posterior teeth lost, there are a number of anterior teeth lost at both Souskiou-*Laona* and Kissonerga-*Mosphilia*. The tooth loss is concentrated on a few individuals with severe dental loss: Cranium C from Tomb 220, bonestack maxilla from Tomb 200 and

Skeleton D from Tomb 200 at Souskiou-*Laona* and Grave 571 at Kissonerga-*Mosphilia*.

Figure 3.67: Percentage of each maxillary tooth lost *in vivo* by site



3.2.1.3 Parietal

3.2.1.3.1 Souskiou-Laona

Only one adult female right parietal displays pathology at Souskiou-*Laona* from Tomb 165, Cranium D. This parietal displays an abnormal depression ectocranially, approximately 10x10mm at the junction of the coronal and saggital sutures, with no transfer through to the endocranial side. There is no evidence of fracture or new bone growth and the aetiology of the depression is unknown, though a well healed depression fracture cannot be ruled out without radiographs. Tables 3.65 and 3.66 present the percentages of parietals observed.

Table 3.65: The parietals from Souskiou-*Laona* by age with the pathologies observed

Age Group	**Count**	**Percent**	**Right/Left/Indeterminate**	**Abnormal depression**	**Percent**
Adult	131	87.3	52/44/35	1	0.8
Subadult	14	9.3	4/5/5	0	0.0
CBA	5	3.4	1/3/1	0	0.0
Total	150	100.0	57/52/41	1	0.7

Table 3.66: The parietals from Souskiou-*Laona* by sex with pathologies observed*

Sex	**Count**	**Abnormal depression**	**Percent**
Male	9	0	0.0
Female	27	1	3.7

*The number of males and females is tabulated accounting for the side of the parietal and therefore does not include those adult parietals for which sex could not be assessed.

There is no evidence of infection, metabolic disorder or infectious or hematopoietic disease or congenital defect. This does not represent a statistically significant difference in expression of pathology of the parietal between males and females at Souskiou-*Laona* (Chi Squared p=0.159).

3.2.1.3.2 Lemba-Lakkous

Table 3.67 presents the percentage of parietals derived from Lemba-*Lakkous* based on age and pathologies observed.

Table 3.67: The parietals from Lemba-*Lakkous* by age with the pathologies observed

Age Group	Count	Percent	Right/Left/Indeterminate	Porosity	Percent
Adult	19	37.3	7/9/4	0	0.0
Subadult	32	62.7	13/10/9	2	6.3
Total	51	100.0	20/18/13	2	3.9

Both parietals with pathology from Lemba-*Lakkous,* one left and one right, are derived from infants, both of which display porosity on the external surface of the bone. However, the left parietal from Grave 34 also displays patches of woven bone which may reflect some form of trauma as well (see Figure 3.37 above). Therefore, the bony reaction of this parietal has an unknown aetiology, while the porosity or porotic hyperostosis on the right parietal from Grave 45 possibly reflects evidence of a disease, disorder or deficiency.

3.2.1.3.3 Kissonerga-Mosphilia

Table 3.68 presents the percentage of parietals derived from Kissonerga-*Mosphilia* based on age and pathologies observed.

Table 3.68: The parietals from Kissonerga-*Mosphilia* by age with the pathologies observed

Age Group	Count	Percent	Right/Left/Indeterminate	Porosity	Percent
Adult	29	36.3	11/10/8	0	0.0
Subadult	51	63.8	16/17/18	2	3.9
Total	80	100.0	27/27/26	2	2.5

A small indeterminate parietal fragment from Skeleton B/D Grave 563 (Figure 3.12) and a fragment from the left parietal from Grave 549 display patches of porosity of the external surface of the bone with some thickening of the diplöe, representing porotic hyperostosis and a possible metabolic disorder, hematopoietic or infectious disease or vitamin or mineral deficiency.

Figure 3.68: (Left) Fragment of subadult parietal from Kissonerga-*Mosphilia* Grave 563 Skeleton B displaying porosity (ectocranial view).

3.2.1.3.4 Comparison

There is no statistically significant difference of pathological expression on the parietals amongst the three sites (Chi Squared p=0.203). However, there is a difference in the types of pathologies expressed between Souskiou-*Laona* and the two settlement sites, with no porosity observed at Souskiou-*Laona*. There is no difference in pathological expression based on side. The differences in expression based on age estimation and pathological expression does not prove to be statistically significant (Chi Squared p=0.308). There is no conclusive evidence of fracture or congenital defect on any of the parietals assessed, with only one parietal expressing an abnormal depression in the superior aspect of the parietal of an adult.

3.2.1.4 Occipital

3.2.1.4.1 Souskiou-Laona

Table 3.69 presents the number of occipital bones examined at Souskiou-*Laona*. No conclusive pathologies were observed.

Table 3.69: The occipitals from Souskiou-*Laona* by age with the pathologies observed

Age Group	**Count**	**Percent**	**Pathology**	**Percent**
Adult	85	84.2	0	0.0
Subadult	13	12.9	0	0.0
CBA	3	3.0	0	0.0
Total	101	100.0	0	0.0

3.2.1.4.2 Lemba-Lakkous

Table 3.70 presents the number of occipital bones examined at Lemba-*Lakkous*. No conclusive pathologies were observed.

Table 3.70: The occipitals from Lemba-*Lakkous* by age with the pathologies observed

Age Group	**Count**	**Percent**	**Pathology**	**Percent**
Adult	10	27.8	0	0.0
Subadult	26	72.2	0	0.0
Total	36	100.0	0	0.0

3.2.1.4.3 Kissonerga-Mosphilia

Table 3.71 presents the number of occipital bones examined at Kissonerga-*Mosphilia*. No conclusive pathologies were observed.

Table 3.71: The occipitals from Kissonerga-*Mosphilia* by age with the pathologies observed

Age Group	**Count**	**Percent**	**Abnormal Bone Growth**	**Percent**
Adult	18	33.3	1	5.6
Subadult	36	66.7	0	0.0
Total	54	100.0	0	1.9

A young adult male occipital from Grave 574 displays a bone growth, which is 11.1x9.95x1.5mm, on the external aspect just above the external occipital protuberance (see Figure 3.59 above). This flat growth has a small groove down the middle and may be slightly polished (possibly post-mortem). It was most likely asymptomatic and possibly represents a non-pathological non-metric trait.

3.2.1.4.4 Comparison

There is no statistically significant difference amongst the three sites and pathological expression on the occipital bones (Chi Squared p=0.853). There is no conclusive evidence of disease or disorder, infection, trauma or congenital pathology on any of the occipitals examined.

3.2.1.5 Temporal

3.2.1.5.1 Souskiou-Laona

Table 3.72 presents the percentage of temporal bones derived from Souskiou-*Laona*. There were no pathologies observed.

Table 3.72: The temporal from Souskiou-*Laona* by age with the pathologies observed

Age Group	**Count**	**Percent**	**Right/Left/Indeterminate**	**Pathology**	**Percent**
Adult	218	85.5	80/82/56	0	0.0
Subadult	33	12.9	15/12/6	0	0.0
CBA	4	1.6	3/0/1	0	0.0
Total	255	100.0	98/94/63	0	0.0

3.2.1.5.2 Lemba-Lakkous

Table 3.73 presents the percentage of temporal bones derived from Lemba-*Lakkous*. There were no pathologies observed.

Table 3.73: The temporal from Lemba-*Lakkous* by age with the pathologies observed

Age Group	Count	Percent	Right/Left/Indeterminate	Pathology	Percent
Adult	30	35.3	12/12/6	0	0.0
Subadult	55	64.7	23/25/7	0	0.0
Total	85	100.0	35/37/13	0	0.0

3.2.1.5.3 Kissonerga-Mosphilia

Table 3.74 presents the percentage of temporal bones derived from Kissonerga-*Mosphilia*. There were no pathologies observed.

Table 3.74: The temporal from Kissonerga-*Mosphilia* by age with the pathologies observed

Age Group	Count	Percent	Right/Left/Indeterminate	Pathology	Percent
Adult	40	38.5	15/16/9	0	0.0
Subadult	64	61.5	26/29/9	0	0.0
Total	104	100.0	41/45/18	0	0.0

3.2.1.5.4 Comparison

None of the temporal bones examined from any of the sites display any evidence of pathology.

3.2.1.6 Sphenoid

3.2.1.6.1 Souskiou-Laona

Table 3.75 presents the number of partial sphenoids examined at Souskiou-*Laona*. No conclusive pathologies were observed.

Table 3.75: Sphenoids from Souskiou-*Laona* by age with the pathologies observed

Age Group	Count	Percent	Pathology	Percent
Adult	39	92.9	0	0.0
Subadult	2	4.7	0	0.0
CBA	1	2.4	0	0.0
Total	42	100.0	0	0.0

3.2.1.6.2 Lemba-Lakkous

Table 3.76 presents the number of partial sphenoids examined at Lemba-*Lakkous*. Porosity was observed on anterior aspect of the orbit of the young female from Grave 50 (Figure 3.69). This individual also displays porosity on the superior aspect of the frontal orbit. This may reflect a possible metabolic disorder, infectious or hematopoietic disease or vitamin or mineral deficiency such as scurvy.

Table 3.76: Sphenoids from Lemba-*Lakkous* by age with the pathologies observed

Age Group	**Count**	**Percent**	**Porosity**	**Percent**
Adult	10	41.7	1	10.0
Subadult	14	58.3	0	0.0
Total	24	100.0	1	4.2

There is no statistically significant difference between expression of pathology on the sphenoid and males and females (Chi Squared p=0.651).

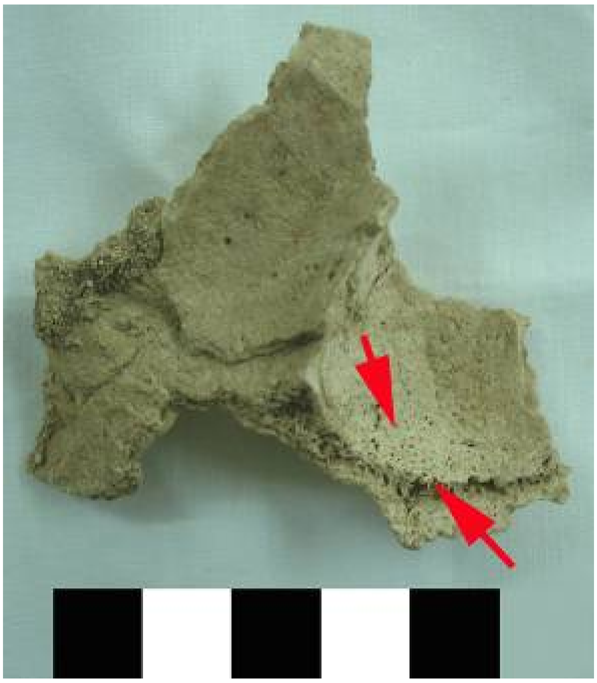


Figure 3.69: (Left) Fragment of sphenoid (superior-anterior view) with porosity on the orbit as indicated by the arrows, from Grave 50.

3.2.1.6.3 Kissonerga-Mosphilia

Table 3.77 presents the number of partial sphenoids examined at Kissonerga-*Mosphilia*. No conclusive pathologies were observed.

Table 3.77: Sphenoids from Kissonerga-*Mosphilia* by age with the pathologies observed

Age Group	**Count**	**Percent**	**Porosity**	**Percent**
Adult	9	32.1	0	0.0
Subadult	19	67.9	0	0.0
Total	28	100.0	0	0.0

3.2.1.6.4 Comparison

Given the fragile nature of the sphenoid, most do not survive intact or even with many recognizable fragments at any of the sites and thus were always described as axial or indeterminate. There is no statistically significant difference in pathological expression on the sphenoid across the three sites (Chi Squared p=0.282). There is no evidence of congenital defect, infection or trauma on any of the sphenoids examined.

3.2.1.7 Other cranial bones

Other cranial bones were recovered and examined in much smaller quantities from all three sites. These include other facial bones such as the nasal and zygomatic and endocranial bones such as the ethmoid, palatine, vomer and inferior nasal conchae. None of the facial bones display any evidence of pathology, nor do any of the endocranial bones. It must be kept in mind that these bones are typically highly fragmentary and incomplete and are therefore difficult to assess. A number of auditory ossicles were also recovered, particularly from Souskiou-*Laona* where crania were excavated within the controlled laboratory setting and wormian bones were observed at all three sites (Tables 3.78 and 3.79).

Table 3.78: Auditory Ossicles recovered from each site

Bone	**Souskiou-*Laona***	**Kissonerga-*Mosphilia***	**Total**
Incus	9	0	9
Malleus	4	2	6
Total	13	2	15

Table 3.79: Wormian bones recovered from each site

Site	**Count**	**Percent**
Souskiou-*Laona*	18	62.1
Lemba-*Lakkous*	5	17.2
Kissonerga-*Mosphilia*	6	20.7
Total	29	100.0

3.2.2 Mandible[24]

3.2.2.1 Souskiou-Laona

Table 3.80 presents the minimum number of mandibles examined at Souskiou-*Laona* and the types of pathologies observed, based on age groups.

Table 3.80: The mandibles from Souskiou-*Laona* by age with the pathologies observed

Age Group	Count	Percent	AMTL	Percent	Alveolar Resorption	Percent	Apical Abscess	Percent
Adult	86	83.5	11	12.8	1	1.2	0	0.0
Subadult	13	12.6	1	7.7	0	0.0	1	7.7
CBA	4	3.9	2	50.0	0	0.0	0	0.0
Total	103	100.0	14	13.6	1	1.0	1	1.0

The subadult mandible from a commingled context in Tomb 125 (B424 Quadrant IV) has lost the right second molar and left first molar during life and there is an apical abscess in the anterior portion at root tip of left lateral incisor. Individual B, Tomb 155 displays alveolar resorption between the right first and second molars, however the preservation is so poor that it is difficult to assess the extent (see above Figure 3.17). A total of 20 mandibular teeth are observed as being lost *in vivo* from 14 mandibles, resulting in an average of 1.4 teeth missing per mandible. The left first molar is the most frequently lost tooth (n=5), followed closely by the right first molar (n=4) and right second molar (n=4). The other absent teeth are: the right second premolar (n=1), right third molar (n=1), left second molar (n=3) and left third molar (n=2) (Figure 3.73 below). There is no evidence for any of the anterior mandibular teeth being lost *in vivo*. It is difficult to assess the proportion of bilateral tooth loss (a sign of periodontal disease) based on the commingled nature and poor preservation of the mandibles[25] (Figure 3.70 provides an example).

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[24] Please see Chapter 2 discussion of commingled material for dealing with the fragmentary mandibles.

[25] Please refer to the tomb and individual descriptions in Appendix D and E for details as to the ante-mortem tooth loss of a particular mandible – see: Tomb 132 commingled, Tomb 189 Cranium D, Tomb 192 Bonestack, Tomb 200 Bonestack, Tomb 200 Skeleton C, Tomb 201 Bonestack, Tomb 207 commingled, Tomb 207 Bonestack D, Tomb 228 Bonestack, Tomb 228 'looted material' and Tomb 237 Skeleton E.

Figure 3.70: (Left)
Mandible from Tomb 200 Skeleton C displays ante-mortem tooth loss of both the right and left first and second molars, as indicated by the arrows, with complete resorption of the second molars and some resorption of the first molars (lateral left-anterior view).

Congenital absence of the molars is possible in at least three cases, where the teeth are missing and the alveoli is completely resorbed with little to no indication of tooth loss (Bone BU Bonestack B Tomb 220, partial mandible from Bonestack B Tomb 220 and Skeleton E Tomb 237). However, without radiographs it is not possible to determine if the tooth was lost well before death or is congenitally absent or impacted. In most cases, *in vivo* tooth loss can be ascertained where there is active resorption of the alveolar bone with evidence of porosity.

Table 3.81 presents the percentage of male and female mandibles which display evidence of a particular pathology. This does not represent a statistically significant difference in pathological expression on the mandibles between the sexes at Souskiou-*Laona* (Chi Squared p=0.080).

Table 3.81: The mandibles from Souskiou-*Laona* by sex with pathologies observed*

Sex	**Count**	**AMTL**	**Percent**	**Alveolar Resorption**	**Percent**	**Apical Abscess**	**Percent**
Male	14	2	14.3	1	7.1	0	0.0
Female	17	2	11.8	0	0.0	0	0.0

*The minimum number of males and female mandibles refers only to mandibles which have an assessed sex based on morphological traits in Buikstra and Ubelaker (1994)

.

There is no evidence of osteoarthritic changes, infection, metabolic disorder or infectious or hematopoietic disease or trauma on any of the mandibles.

3.2.2.2 Lemba-Lakkous

Table 3.82 presents the minimum number of mandibles examined at Lemba-*Lakkous* and the types of pathologies observed, based on age groups.

Table 3.82: The mandibles from Lemba-*Lakkous* by age with the pathologies observed

Age Group	**Count**	**Percent**	**AMTL**	**Percent**	**Apical Abscess**	**Percent**
Adult	10	29.4	3	30.0	0	0.0
Subadult	24	70.6	1	4.2	1	4.2
Total	34	100.0	4	11.8	1	2.9

The child mandible from Grave 46 displays an apical abscess at the root end of the left deciduous second molar with a 6.3mm hole (see Figure 3.38 above). There are four observed cases of *in vivo* tooth loss. A total of 10 mandibular teeth were lost *in vivo* from four mandibles, resulting in an average of 2.5 teeth lost per mandible. The left second molar is the most frequently lost tooth (n=3), followed closely by the right second molar (n=2) and left first molar (n=2). The other missing teeth are: the right first molar (n=1), right third molar (n=1) and left third molar (n=1) (see Figure 3.73 below). There is no evidence for any of the anterior mandibular teeth being lost *in vivo*. There are two recorded cases of bilateral tooth loss from the mandibles observed. The adult female from Grave 35 has lost both second molars during life. The young adult female from Grave 25 is missing all three molars from both sides of the mandible, which may in fact represent congenital absence or impaction of the molars (see Figure 3.23 above). In regards to ante-mortem tooth loss, the adolescent from Grave 33 has lost the left first molar and the adult male from Grave 26 has lost the left second molar (Figure 3.71).

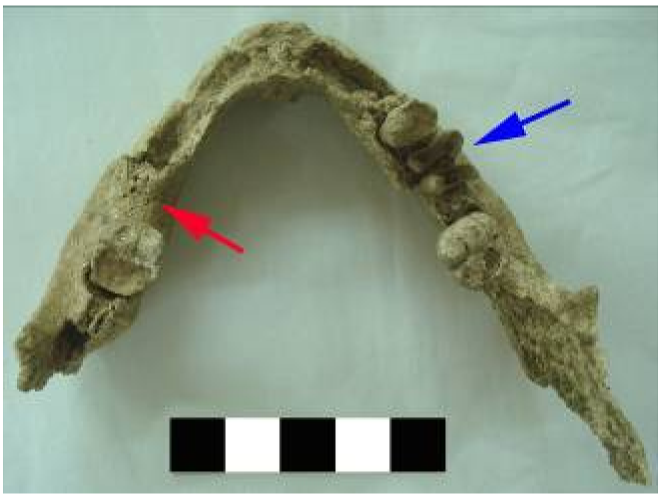


Figure 3.71: (Left) The mandible from Grave 26 displays ante-mortem tooth loss of the left second molar (left arrow) and the first molar has been completely destroyed by caries (right arrow). Occlusal/superior view.

Table 3.83: The mandibles from Lemba-*Lakkous* by sex with the pathologies observed

Sex	Count	AMTL	Percent	Apical Abscess	Percent
Male	3	1	33.3	0	0.0
Female	7	2	28.6	0	0.0

Table 3.83 presents the pathologies observed on the mandibles at Lemba-*Lakkous* based on sex. There is no statistically significant difference in pathological expression on the mandibles between the sexes at Lemba-*Lakkous* (Chi Squared p=0.437). There is no evidence of osteoarthritic changes, infection, metabolic disorder or infectious or hematopoietic disease or trauma.

3.2.2.3 Kissonerga-Mosphilia

Table 3.84 presents the minimum number of mandibles examined at Kissonerga-*Mosphilia* and the types of pathologies observed, based on age groups.

Table 3.84: The mandibles from Kissonerga-*Mosphilia* by age with the pathologies observed

Age Group	Count	Percent	AMTL	Percent	Apical Abscess	Percent
Adult	19	34.5	3	15.8	2	10.5
Subadult	36	65.5	0	0.0	0	0.0
Total	55	100.0	3	5.5	2	3.6

There are three mandibles which display ante-mortem tooth loss, including two which also display at least one apical abscess. While there is less pathology affecting the mandibles at Kissonerga-*Mosphilia*, it is much more severe in expression with both tooth loss and evidence of infection affecting two individuals. A total of eight mandibular teeth are observed as being lost *in vivo* from three mandibles, resulting in an average of 2.7 teeth lost per mandible. The left and right third molars are the most frequently lost teeth (n=2, n=2), however, it is also possible that these teeth are congenitally absent (Figure 3.73 below). The young adult female from Grave 545 has lost the left first molar. The young adult female from Grave 546 is missing both third molars and displays an apical abscess (8.8mm wide) at the root of the right first molar (Figure 3.72 and Figure 3.60 above). All other missing teeth (a right lateral incisor, canine and first premolar) are all from the adult female mandible within Grave 571. This individual displays the worst case of dental disease and pathology of those from all three sites examined. There are several apical abscesses which have led to osteomyelitis of the mandible (see Figures 2.15 and 3.42).

Figure 3.72: (Left) Mandible from Grave 546 with arrows indicating either ante-mortem tooth loss or congenital absence of the third molars and the location of the apical abscess at the right first molar (occlusal/superior view with anterior aspect inferior).

There are two recorded cases of bilateral loss of the same tooth within the mandibles observed, both of which possibly indicate congenital absence of the third molars or periodontal disease. Table 3.85 presents the percentage of each sex with a particular pathology. There is no statistically significant difference in pathological expression on the mandibles between the sexes at Kissonerga-*Mosphilia* (Chi Squared p=0.270). There is no evidence of osteoarthritic changes, infection, metabolic disorder or infectious or hematopoietic disease or trauma.

Table 3.85: The mandibles from Kissonerga-*Mosphilia* by sex with the pathologies observed

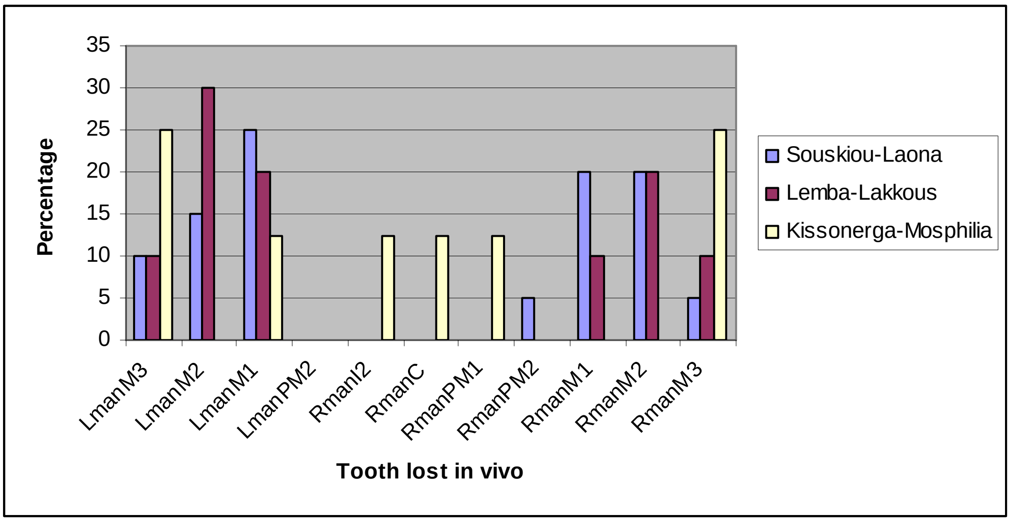
Sex	**Count**	**AMTL**	**Percent**	**Apical Abscess**	**Percent**
Male	6	0	0.0	0	0.0
Female	17	3	17.3	2	11.8

3.2.2.4 Comparison

There is no statistically significant difference amongst the three sites in regards to pathological expression on the mandible (Chi Squared p=0.065). Ante-mortem tooth loss is the most prevalent pathology observed at all three sites (included within this sample are six cases which may represent congenital absence or impaction of third molars rather than *in vivo* loss). Apical abscesses and alveolar resorption comprise the other two pathology types observed on the mandibles.

It is difficult to discuss periodontal disease in regards to ante-mortem tooth loss for this study as many of the mandibles were only partially present. The bilateral loss of a particular tooth in the mandible was observed in one case at Lemba-*Lakkous* with the possibility of bilateral congenital absence of the third molars in two cases at Kissonerga-*Mosphilia*, one at Lemba-*Lakkous* and one at Souskiou-*Laona*. Therefore, it is more productive to look at percentage of each tooth lost per site to observe any differences in expression (Figure 3.73). It is evident that at all three sites, the posterior teeth are most likely to be lost *in vivo*, with higher percentages of tooth loss. The only case where anterior teeth were lost *in vivo* relates to severe periodontal disease and bone infections (Grave 571, Kissonerga-*Mosphilia*). There is no statistically significant difference in ante-mortem tooth loss amongst the adults from all three sites (Chi Squared p=0.532).

Figure 3.73: Percentage of mandibular teeth lost *in vivo* by site



Apical abscesses are observed at all three sites, though in different age groups. Subadult individuals display apical abscesses at Souskiou-*Laona* and Lemba-*Lakkous*, while only adult individuals do so at Kissonerga-*Mosphilia*. While this is not a statistically significant difference in expression of the abscess, it is interesting to note (Chi Squared p=0.248). As well, the severity of expression of the infection is much higher at Kissonerga-*Mosphilia*. There is only one conclusive case of alveolar resorption observed on all the mandibles at all three sites, from Souskiou-*Laona*. There is no sign of osteoarthritic changes to the condyles, metabolic or infectious diseases or disorders or trauma to any of the mandibles observed from any of the sites.

3.2.3 Teeth

The teeth will be studied by tooth type and position within the dental arch. To facilitate the focus on pathologies, in answering the second research question, the teeth will be analysed under the heading of a particular pathology. It must be remembered at this point, that this section is examining the teeth on a tooth by tooth basis and as such demographic information will be limited. For example, while a permanent first molar may belong to a subadult individual, it will be included in the permanent first molar group and compared with adult permanent first molars. This sub-section is presented as follows: a description of the dental samples from each site, results of the occurrence of calculus, carious lesions, linear enamel hypoplasias (LEH) and attrition at all three sites and a comparison of pathologies based on tooth type.

3.2.3.1 Souskiou-Laona

Figure 3.74 presents the prevalence of the different tooth types at Souskiou-*Laona*. There are slightly fewer third molars as not all individuals will have them due to age or congenital anomalies. The low numbers of deciduous teeth reflect the predominately adult mortuary population at Souskiou-*Laona*. There is a fairly even split between teeth from the left and right sides (Table 3.86). Almost a quarter of all the teeth at Souskiou-*Laona* could not be assessed for pathology (22.1% (n=486)) and will not be included within the analyses below.

Figure 3.74: The number of each tooth type derived from Souskiou-*Laona*

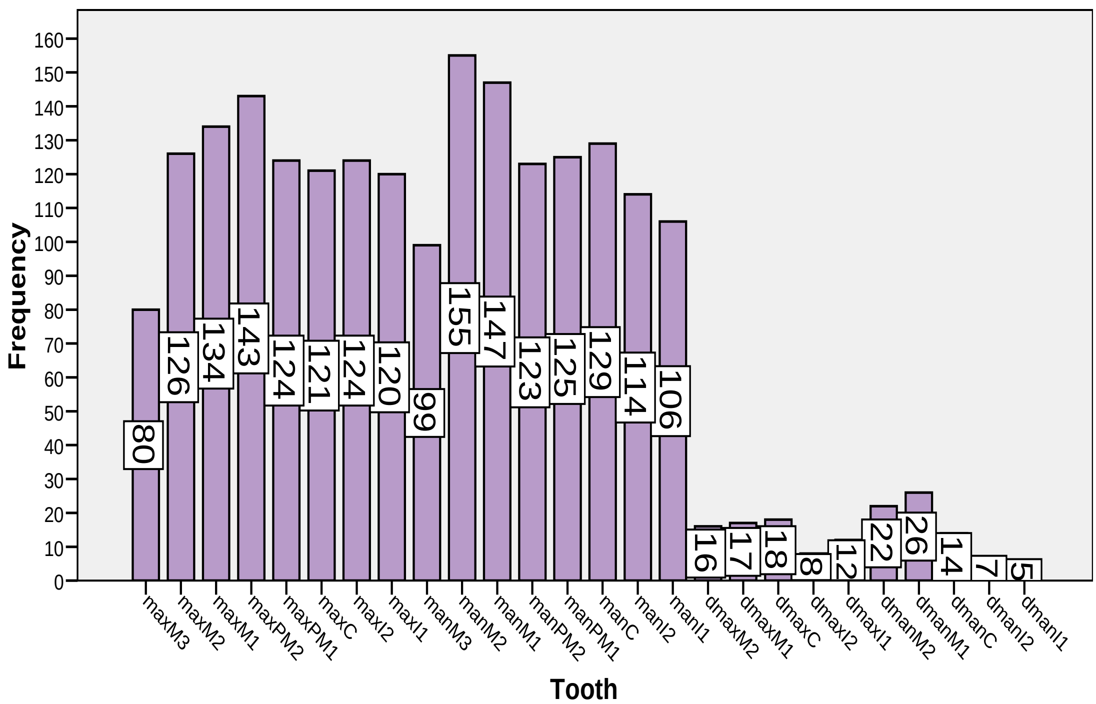


Table 3.86: Percent of teeth from each side

Side	Count	Percent
Indeterminate	105	4.7
Left	1032	46.5
Right	1080	48.7
Total	2217	100.0

3.2.3.2 Lemba-Lakkous

Figure 3.75 presents the prevalence of the different tooth types at Lemba-*Lakkous*. Distribution of the different permanent tooth types varies. A lower percentage of third molars are recovered as there are less mature adults present within the Lemba-*Lakkous* sample. With regard to the deciduous teeth, the molars are more frequently recovered, with fewer incisors as these are the most easily lost post-mortem. There is a fairly even split between teeth from the left and right sides (Table 3.87). Of all the teeth at Lemba-*Lakkous,* 42.2% (n=348) could not be assessed for pathology and will not be included within the analyses.

Figure 3.75: The number of each tooth type derived from Lemba-*Lakkous*

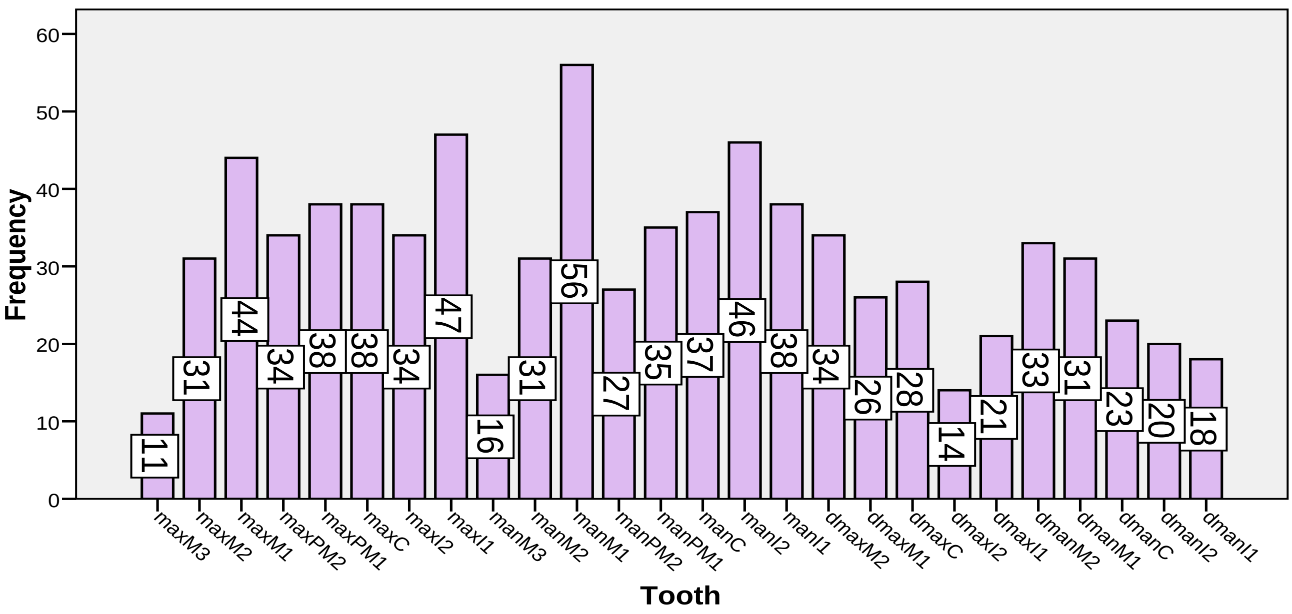


Table 3.87: Percent of teeth from each side

Side	Count	Percent
Indeterminate	15	1.8
Left	410	49.7
Right	400	48.5
Total	825	100.0

3.2.3.3 Kissonerga-Mosphilia

Figure 3.76 presents the prevalence of the different tooth types at Kissonerga-*Mosphilia*. Distribution of the different permanent tooth types is fairly even with fewer third molars and first molars representing the greatest number. Fewer third molars were recovered as not all individuals will have them due to age or congenital anomalies. In regards to the deciduous teeth, the molars are more frequently recovered, with fewer incisors as these are the most easily lost post-mortem. There is a fairly even split between teeth from the left and right sides (Table 3.88). Of all the teeth at Kissonerga-*Mosphilia,* 18.1% (n=227) could not be assessed for pathology and will not be included within the analyses below.

Figure 3.76: The number of each tooth type derived from Kissonerga-*Mosphilia*

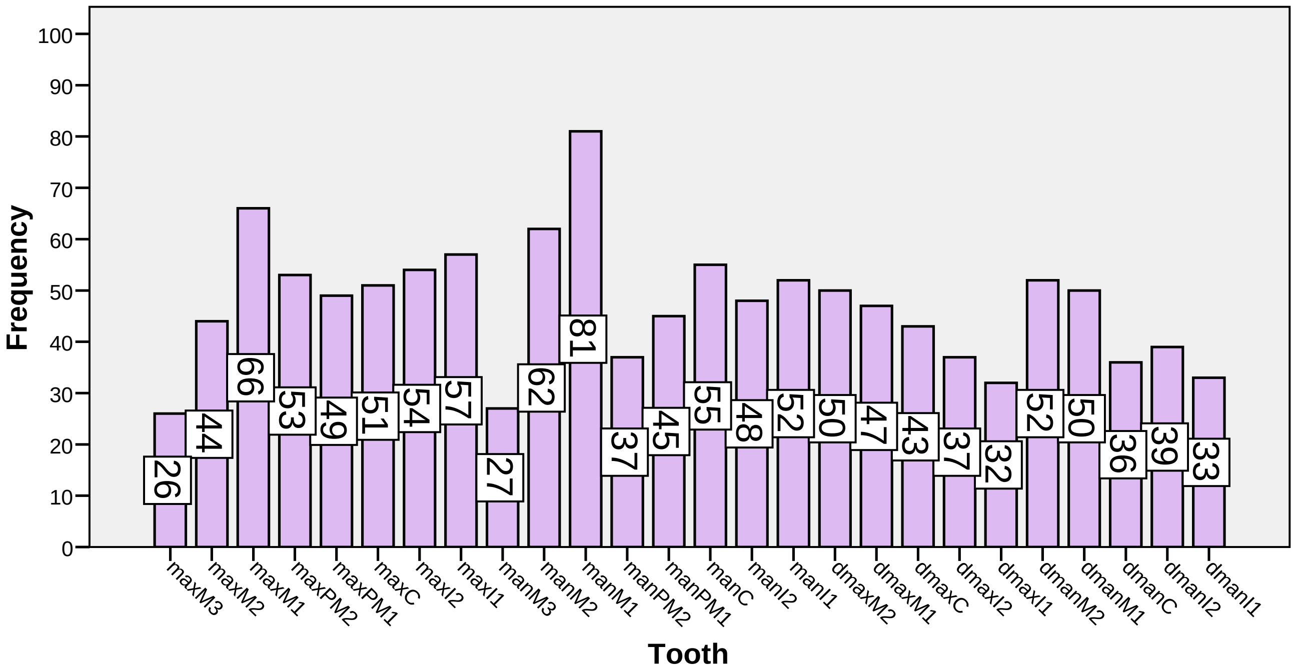


Table 3.88: Percent of teeth from each side

Side	Count	Percent
Indeterminate	28	2.2
Left	640	51.0
Right	587	46.8
Total	1255	100.0

3.2.3.4 Calculus

3.2.3.4.1 Souskiou-Laona

Table 3.90 presents the percentage of each tooth type, by side, which displays calculus. In general, calculus was observed on 10.7% of the maxillary teeth and 12.6% of the mandibular teeth from Souskiou-*Laona*. While the mandibular teeth display a slightly higher frequencies of calculus than the maxillary teeth, there is no statistically significant difference between the upper and lower teeth in regards to calculus accumulation (Chi Squared p=0.209). All calculus which was observed is supragingival, with the exception of one maxillary tooth which displays mild subgingival patches. The severity of the accumulation of calculus varies from mild patches to severe planks which cover an entire plane of the tooth crown (see Figure 2.10). There is an inexplicable statistically significant difference in the prevalence of calculus based on side of the maxillary teeth at Souskiou-*Laona*, with the left displaying a higher prevalence (Table 3.89).

Table 3.89: Percentage of teeth by jaw and side with calculus

Jaw	Left	Right	Chi Squared	Cramer's V
Maxilla	62.5 (n=55)	37.5 (n=33)	p=0.038	8.9%
Mandible	49.6 (n=56)	50.4 (n=57)	p=0.877	N/A

Only one single deciduous maxillary tooth displays calculus, therefore, the comparison of expression of the pathology is focussed on the permanent teeth. In general, the permanent anterior teeth at Souskiou-*Laona* display higher percentages of calculus than the posterior teeth. Both the maxillary and mandibular permanent left central incisors display the highest percentage of calculus expression by tooth position for their respective jaws. In regards to tooth type, the permanent maxillary canine and mandibular incisors display the highest percentage of calculus. This is a statistically significant difference in expression of calculus as both the permanent maxillary and mandibular canines and incisors display significantly more calculus than the premolars and posterior teeth (Chi Squared p=0.000, Cramer's V=19.9% and p=0.000, Cramer's V=25.9% respectively).

Table 3.90: Percentage teeth with calculus by tooth type and side at Souskiou-*Laona*

Tooth		Left	Right	Total[26]	Tooth	Left	Right	Total
maxM3	Count	3/26	0/40	3/66	manM3	4/43	4/47	8/90
	Percentage	11.5%	0.0%	4.5%		9.3%	8.5%	8.9%
maxM2	Count	9/55	2/49	11/104	manM2	2/66	3/74	5/140
	Percentage	16.4%	4.1%	10.6%		3.0%	4.1%	3.6%
maxM1	Count	3/53	2/52	5/105	manM1	5/56	4/67	9/123
	Percentage	5.7%	3.8%	4.8%		8.9%	6.0%	7.3%
maxPM2	Count	3/53	4/60	7/113	manPM2	4/48	5/55	9/104
	Percentage	5.7%	6.7%	6.2%		8.3%	9.1%	8.7%
maxPM1	Count	5/45	2/52	7/97	manPM1	6/50	8/58	14/108
	Percentage	11.1%	3.8%	7.2%		12.0%	13.8%	13.0%
maxC	Count	10/51	11/47	21/98	manC	12/50	14/50	26/100
	Percentage	19.6%	23.4%	21.4%		24.0%	28.0%	26.0%
maxI2	Count	8/57	7/47	15/104	manI2	9/40	8/50	17/90
	Percentage	14.0%	14.9%	14.4%		22.5%	16.0%	18.9%
maxI1	Count	13/44	5/44	18/88	manI1	14/43	11/38	25/81
	Percentage	29.5%	11.4%	20.5%		32.6%	28.9%	30.9%
dmaxM2	Count	0/5	0/7	0/12	dmanM2	0/11	0/9	0/20
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxM1	Count	0/7	0/5	0/12	dmanM1	0/14	0/10	0/24
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxC	Count	0/5	0/4	0/9	dmanC	0/6	0/4	0/10
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI2	Count	0/4	0/2	0/6	dmanI2	0/2	0/2	0/4
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI1	Count	1/5	0/5	1/10	dmanI1	0/1	0/1	0/2
	Percentage	20.0%	0.0%	10.0%		0.0%	0.0%	0.0%

3.2.3.4.2 Lemba-Lakkous

Table 3.92 presents the percentages of calculus expression by tooth type and side of the teeth derived from Lemba-*Lakkous*. In general, calculus was observed on 5.4% of the maxillary teeth and 7.3% of the mandibular teeth from Lemba-*Lakkous*. Overall, the mandibular and maxillary teeth display similar frequencies of calculus and there is no statistically significant difference between the upper and lower teeth in regards to calculus accumulation (Chi Squared p=0.396), nor between the right and left sides based on jaw (Table 3.91). All calculus which was observed is supragingival. The severity of the accumulation of calculus varies from mild patches to severe planks which cover an entire plane of the tooth crown, however in most cases it occurs as a mild to moderate line or ridge across the tooth surface (see Figure 2.10).

[26] The totals include teeth which could be assigned a tooth type and location but could not be sided within the dental arch. There are only 25 teeth with a crown which could not be sided.

Table 3.91: Percentage of teeth by jaw and side with calculus

Jaw	Left	Right	Chi Squared
Maxilla	38.5 (n=5)	61.5 (n=7)	P=0.313
Mandible	41.2 (n=7)	58.8 (n=10)	P=0.293

None of the deciduous teeth display calculus. Therefore, the comparison of expression of calculus is focussed on the permanent teeth. Both the maxillary and mandibular third molars exhibit the highest frequency of calculus, however this is likely biased by the small sample size of these teeth. There is no statistically significant difference in the calculus expression based on tooth position for either the maxillary or mandibular teeth (Chi Squared p=0.409 and p=0.427 respectively). None of the second premolars in either jaw display any calculus. In general, there is minimal calculus accumulation on the teeth from Lemba-*Lakkous*.

Table 3.92: Percentage of teeth with calculus by tooth type and side at Lemba-*Lakkous*

Tooth		Left	Right	Total	Tooth	Left	Right	Total
maxM3	Count	1/4	1/4	2/8	manM3	1/7	2/7	3/14
	Percentage	25.0%	25.0%	25.0%		14.3%	28.6%	21.4%
maxM2	Count	1/12	1/12	2/24	manM2	1/10	1/12	2/22
	Percentage	8.3%	8.3%	8.3%		10.0%	8.3%	9.1%
maxM1	Count	0/17	2/17	2/34	manM1	1/17	1/17	2/34
	Percentage	0.0%	11.8%	5.9%		5.9%	5.9%	5.9%
maxPM2	Count	0/13	0/9	0/22	manPM2	0/9	0/7	0/16
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxPM1	Count	0/14	1/10	1/24	manPM1	0/10	1/9	1/19
	Percentage	0.0%	10.0%	4.2%		0.0%	11.1%	5.3%
maxC	Count	2/13	1/12	3/25	manC	1/12	1/8	2/20
	Percentage	15.4%	8.3%	12.0%		8.3%	12.5%	10.0%
maxI2	Count	0/11	1/10	1/21	manI2	1/10	2/10	3/20
	Percentage	0.0%	10.0%	4.8%		10.0%	20.0%	15.0%
maxI1	Count	1/14	1/14	2/28	manI1	2/13	2/9	4/22
	Percentage	7.1%	7.1%	7.1%		15.4%	22.2%	18.2%
dmaxM2	Count	0/7	0/10	0/17	dmanM2	0/9	0/7	0/16
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxM1	Count	0/5	0/6	0/11	dmanM1	0/10	0/6	0/16
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxC	Count	0/8	0/6	0/14	dmanC	0/9	0/6	0/15
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI2	Count	0/4	0/1	0/5	dmanI2	0/6	0/6	0/12
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI1	Count	0/4	0/5	0/9	dmanI1	0/3	0/5	0/8
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

3.2.3.4.3 Kissonerga-Mosphilia

Table 3.94 presents the percentage of teeth displaying calculus by tooth type and side. In general, calculus was observed on 11.1% of the maxillary teeth and 15.2% of the mandibular teeth from Kissonerga-*Mosphilia*. The mandibular teeth at Kissonerga-*Mosphilia* display slightly higher frequencies of calculus, in most cases, based on tooth position than the maxillary teeth. However, there is no statistically significant difference between the upper and lower teeth in regards to calculus accumulation at Kissonerga-*Mosphilia* (Chi Squared p=0.053). There is no significant difference in calculus expression based on jaw and side (Table 3.93). All calculus observed is supragingival. The severity of the accumulation of calculus varies from mild patches to severe planks which cover an entire plane of the tooth crown.

Table 3.93: Percentage of teeth by jaw and side with calculus

Jaw	**Left**	**Right**	**Chi Squared**
Maxilla	43.6 (n=24)	56.4 (n=31)	P=0.221
Mandible	57.5 (n=42)	42.5 (n=31)	P=0.321

Three deciduous maxillary teeth display calculus at Kissonerga-*Mosphilia*, thus there is no opportunity for comparison. Therefore, the comparison of expression of calculus is focussed on the permanent teeth. In general, the expression of calculus accumulation is fairly evenly split across permanent teeth by position at Kissonerga-*Mosphilia*. The maxillary third molars display the highest percentage of teeth with calculus of the maxillary teeth and the mandibular permanent incisors display the highest percentage of calculus overall. When examined by tooth position, the mandibular left third molar displays the highest frequency of calculus. There is no statistically significant difference in the expression of calculus amongst the permanent maxillary teeth by tooth position (Chi Squared p=0.910). There is however a statistically significant difference in expression of calculus amongst the permanent mandibular teeth with the incisors displaying significantly more calculus than the other teeth (Chi Squared p=0.005, Cramer's V=25.5%).

Table 3.94: Percentage teeth with calculus by tooth type and side at Kissonerga-*Mosphilia*

Tooth		Left	Right	Total	Tooth	Left	Right	Total
maxM3	Count	2/11	4/15	6/26	manM3	5/11	3/9	8/20
	Percentage	18.2%	26.7%	23.1%		45.5%	33.3%	40.0%
maxM2	Count	4/25	4/18	8/43	manM2	5/23	1/24	6/47
	Percentage	16.0%	22.2%	18.6%		21.7%	4.2%	12.8%
maxM1	Count	4/29	5/25	9/54	manM1	5/33	4/28	9/61
	Percentage	13.8%	20.0%	16.7%		15.2%	14.3%	14.8%
maxPM2	Count	3/25	2/20	5/45	manPM2	3/13	1/14	4/27
	Percentage	12.0%	10.0%	11.1%		23.1%	7.1%	14.8%
maxPM1	Count	3/20	2/19	5/39	manPM1	5/19	2/16	7/35
	Percentage	15.0%	10.5%	12.8%		26.3%	12.5%	20.0%
maxC	Count	1/21	3/17	4/38	manC	4/21	5/21	9/42
	Percentage	4.8%	17.6%	10.5%		19.0%	23.8%	21.4%
maxI2	Count	4/21	3/23	7/44	manI2	7/22	6/17	13/39
	Percentage	19.0%	13.0%	15.9%		31.8%	35.3%	33.3%
maxI1	Count	2/22	6/26	8/48	manI1	8/19	9/21	17/40
	Percentage	9.1%	23.1%	16.7%		42.1%	42.9%	42.5%
dmaxM2	Count	1/17	0/18	1/35	dmanM2	0/23	0/20	0/43
	Percentage	5.9%	0.0%	2.9%		0.0%	0.0%	0.0%
dmaxM1	Count	0/17	0/16	0/33	dmanM1	0/22	0/18	0/40
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxC	Count	0/20	1/15	1/35	dmanC	0/15	0/13	0/28
	Percentage	0.0%	6.7%	2.9%		0.0%	0.0%	0.0%
dmaxI2	Count	0/16	1/15	1/31	dmanI2	0/17	0/14	0/31
	Percentage	0.0%	6.7%	3.2%		0.0%	0.0%	0.0%
dmaxI1	Count	0/11	0/14	0/25	dmanI1	0/12	0/14	0/26
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

3.2.3.4.4 Comparison

Overall, Lemba-*Lakkous* displays significantly less teeth with calculus than either Souskiou-*Laona* or Kissonerga-*Mosphilia*. There is no significant difference between Kissonerga-*Mosphilia* and Souskiou-*Laona*[27]. Lemba-*Lakkous* displays significantly more teeth with calculus on the maxillary third molars (Chi Squared p=0.016) and Kissonerga-*Mosphilia* displays a significantly higher frequency of the maxillary first molars (Chi Squared p=0.031) and mandibular third molars (Chi Squared p=0.002). The rest of the teeth do not have a significant difference in expression of calculus across the three sites. Overall, there is no significant difference in calculus expression based on the side from which the tooth is located (Chi Squared p=0.266). The severity

[27] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.003, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.488 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.000.

of the calculus varies within and across the sites, from mild patches and ridges to severe ridges and planks (see Figure 2.10).

<u>*3.2.3.5 Caries*</u>

3.2.3.5.1 Souskiou-Laona

Table 3.96 presents the percentage of dental caries observed, by tooth type and side, at Souskiou-*Laona*. In general, dental caries were observed on 5.5% of the maxillary teeth and 3.6% of the mandibular teeth from Souskiou-*Laona*. There is no statistically significant difference between the upper and lower teeth in regards to the occurrence of carious lesions (Chi Squared p=0.059), nor based on the side the carious tooth is located (Table 3.95). The severity of the caries varies from small pits to large carious lesions which have destroyed the better part of the crown. At Souskiou-*Laona*, the majority of the carious lesions are quite small holes or pits in the tooth crown with only a few cases of total crown destruction. This may be impacted by the fact that most teeth were found loose and commingled, therefore teeth which could not be identified due to the loss of the crown were recorded as indeterminate tooth roots and the pathology could not be assessed.

Table 3.95: Percentage of teeth by jaw and side with caries

Jaw	**Left**	**Right**	**Chi Squared**
Maxilla	46.7 (n=21)	53.3 (n=24)	p=0.670
Mandible	41.9 (n=13)	58.1 (n=18)	p=0.488

There are eight deciduous teeth which display a dental caries. As there were very few deciduous teeth examined at Souskiou-*Laona*, the carious teeth represent a large proportion of the sample. Due to the much larger sample of permanent teeth, the comparison of expression of carious lesions is focussed on the permanent teeth. In general, the permanent posterior teeth at Souskiou-*Laona* display far higher percentages of caries than the anterior teeth. Both the maxillary and mandibular permanent right second molars display the highest percentage of teeth with caries by tooth position for their respective jaws. In regards to tooth type, the permanent second molars display the highest percentage of carious lesions. This is a statistically significant difference in expression of dental caries as the permanent maxillary and mandibular molars display significantly more carious teeth than the premolars and anterior teeth (Chi Squared p=0.000, Cramer's V=25.6% and p=0.007, Cramer's V=15.3% respectively).

Table 3.96: Percentage of teeth with caries by tooth type and side at Souskiou-*Laona*

Tooth		Left	Right	Total	Tooth	Left	Right	Total
maxM3	Count	1/26	5/40	6/66	manM3	2/43	3/47	5/90
	Percentage	3.8%	12.5%	9.1%		4.7%	6.4%	5.7%
maxM2	Count	8/55	8/49	16/104	manM2	5/66	6/74	11/140
	Percentage	14.5%	16.3%	15.4%		7.6%	8.1%	7.9%
maxM1	Count	6/53	6/52	12/105	manM1	1/56	5/67	6/123
	Percentage	11.3%	11.5%	11.4%		1.8%	7.5%	4.9%
maxPM2	Count	4/53	2/60	6/113	manPM2	1/48	2/55	4/104
	Percentage	7.5%	3.3%	5.3%		2.1%	3.6%	3.8%
maxPM1	Count	0/45	0/52	0/97	manPM1	1/50	1/58	2/108
	Percentage	0.0%	0.0%	0.0%		2.0%	1.7%	1.9%
maxC	Count	0/51	0/47	0/98	manC	1/50	0/50	1/100
	Percentage	0.0%	0.0%	0.0%		2.0%	0.0%	1.0%
maxI2	Count	0/57	1/47	1/104	manI2	0/40	0/50	0/90
	Percentage	0.0%	2.1%	1.0%		0.0%	0.0%	0.0%
maxI1	Count	0/44	0/44	0/88	manI1	0/43	0/38	0/81
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxM2	Count	1/5	1/7	2/12	dmanM2	1/11	1/9	2/20
	Percentage	20.0%	14.3%	16.7%		9.1%	11.1%	10.0%
dmaxM1	Count	1/7	1/5	2/12	dmanM1	1/14	0/10	1/24
	Percentage	14.3%	20.0%	16.7%		7.1%	0.0%	4.2%
dmaxC	Count	0/5	0/4	0/9	dmanC	0/6	0/4	0/10
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI2	Count	0/4	0/2	0/6	dmanI2	0/2	0/2	0/4
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI1	Count	0/5	0/5	1/10	dmanI1	0/1	0/1	0/2
	Percentage	0.0%	0.0%	10.0%		0.0%	0.0%	0.0%

3.2.3.5.2 Lemba-Lakkous

Table 3.98 presents the percentage of teeth, by type and side, which display carious lesions. In general, dental caries were observed on 1.8% of the maxillary teeth and 4.1% of the mandibular teeth from Lemba-*Lakkous*. The higher frequency of carious mandibular teeth at Lemba-*Lakkous* represents a statistically significant difference between the upper and lower teeth (Chi Squared p=0.046, Cramer's V=7.0%). There is no significant difference between the prevalence of carious teeth based on side (Table 3.97). The severity of the caries varies from small pits to large carious lesions which have destroyed the better part of the crown. At Lemba-*Lakkous*, there are a higher proportion of large carious lesions than at Souskiou-*Laona*, in some cases the *in situ* tooth has lost most of its crown.

Table 3.97: Percentage of teeth by jaw and side with caries

Jaw	Left	Right	Chi Squared
Maxilla	85.7 (n=6)	14.3 (n=1)	p=0.059
Mandible	41.2 (n=7)	58.8 (n=10)	p=0.415

There are only two mandibular deciduous molars which display caries, therefore the comparison of expression of carious lesions at Lemba-*Lakkous* is focussed on the permanent teeth. In general, the permanent posterior teeth at Lemba-*Lakkous* display far higher percentages of caries than the premolars or anterior teeth. The mandibular permanent right second molar displays the highest percentage of teeth with caries by tooth position, while the maxillary left first molar displays the highest percentage of the maxillary teeth. With regard to tooth type, the permanent second molars display the highest percentage of dental caries. There is no statistically significant difference in expression of dental caries based on tooth position for the maxillary teeth (Chi Squared p=0.425). The first and second mandibular molars display significantly more carious lesions than the premolars and anterior teeth (Chi Squared p=0.001, Cramer's V=39.0%).

Table 3.98: Percentage of teeth with caries by tooth type and side at Lemba-*Lakkous*

Tooth		Left	Right	Total	Tooth	Left	Right	Total
maxM3	Count	0/4	0/4	0/8	manM3	0/7	1/7	1/14
	Percentage	0.0%	0.0%	0.0%		0.0%	14.3%	7.1%
maxM2	Count	1/12	1/12	2/24	manM2	2/10	5/12	7/22
	Percentage	8.3%	8.3%	8.3%		20.0%	41.7%	31.8%
maxM1	Count	3/17	0/17	3/34	manM1	2/17	4/17	6/34
	Percentage	17.6%	0.0%	8.8%		11.8%	23.5%	17.6%
maxPM2	Count	1/13	0/9	1/22	manPM2	1/9	0/7	1/16
	Percentage	7.7%	0.0%	4.5%		11.1%	0.0%	6.3%
maxPM1	Count	1/14	0/10	1/24	manPM1	0/10	0/9	0/19
	Percentage	7.1%	0.0%	4.2%		0.0%	0.0%	0.0%
maxC	Count	0/13	0/12	0/25	manC	0/12	0/8	0/20
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxI2	Count	0/11	0/10	0/21	manI2	0/10	0/10	0/20
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxI1	Count	0/14	0/14	0/28	manI1	0/13	0/9	0/22
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxM2	Count	0/7	0/10	0/17	dmanM2	1/9	0/7	1/16
	Percentage	0.0%	0.0%	0.0%		11.1%	0.0%	6.3%
dmaxM1	Count	0/5	0/6	0/11	dmanM1	1/10	0/6	1/16
	Percentage	0.0%	0.0%	0.0%		10.0%	0.0%	6.3%
dmaxC	Count	0/8	0/6	0/14	dmanC	0/9	0/6	0/15
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

Tooth		Left	Right	Total	Tooth	Left	Right	Total
dmaxI2	Count	0/4	0/1	0/5	dmanI2	0/6	0/6	0/12
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI1	Count	0/4	0/5	0/9	dmanI1	0/3	0/5	0/8
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

3.2.3.5.3 Kissonerga-Mosphilia

Table 3.100 presents the percentage of teeth, by type and side, with carious lesions. In general, dental caries were observed on 1.0% of the maxillary teeth and 0.4% of the mandibular teeth from Kissonerga-*Mosphilia*. There is no statistically significant difference between the upper and lower teeth in regards to the occurrence of carious lesions (Chi Squared p=0.248). There is no significant difference between the prevalence of carious teeth based on side (Table 3.99). While there are very few caries observed at Kissonerga-*Mosphilia*, those which are present are in most cases quite severe, particularly the two affecting the mandibular teeth.

Table 3.99: Percentage of teeth by jaw and side with caries

Jaw	Left	Right	Chi Squared
Maxilla	20.0 (n=1)	80.0 (n=4)	p=0.158
Mandible	0.0 (n=0)	100.0 (n=2)	p=0.139

A single deciduous right maxillary first molar from Kissonerga-*Mosphilia* displays a carious lesion. The comparison of expression of carious lesions at Kissonerga-*Mosphilia* is therefore focussed on the permanent teeth. In general, the low occurrence of dental caries at Kissonerga-*Mosphilia* makes the distribution rather even across the teeth by position. The maxillary permanent right second molar and the mandibular right third molar display the highest percentage of teeth with caries by tooth position. With regard to tooth type, the permanent second molars display the highest percentage of dental caries with the permanent maxillary second molars displaying significantly more caries than the other maxillary teeth (Chi Squared p=0.041, Cramer's V=21.8%). There is no statistically significant difference in the frequency of caries based on tooth position for the permanent mandibular teeth (Chi Squared p=0.300).

Table 3.100: Percentage of teeth with caries by tooth type and side at Kissonerga-*Mosphilia*

Tooth		Left	Right	Total	Tooth	Left	Right	Total
maxM3	Count	0/11	0/15	0/26	manM3	0/11	1/9	1/20
	Percentage	0.0%	0.0%	0.0%		0.0%	11.1%	5.0%
maxM2	Count	1/25	2/18	3/43	manM2	0/23	0/24	0/47
	Percentage	4.0%	11.1%	7.0%		0.0%	0.0%	0.0%
maxM1	Count	0/29	0/25	0/54	manM1	0/33	1/28	1/61
	Percentage	0.0%	0.0%	0.0%		0.0%	3.6%	1.6%
maxPM2	Count	0/25	0/20	0/45	manPM2	0/13	0/14	0/27
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxPM1	Count	0/20	0/19	0/39	manPM1	0/19	0/16	0/35
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxC	Count	0/21	1/17	1/38	manC	0/21	0/21	0/42
	Percentage	0.0%	5.9%	2.6%		0.0%	0.0%	0.0%
maxI2	Count	0/21	0/23	0/44	manI2	0/22	0/17	0/39
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxI1	Count	0/22	0/26	0/48	manI1	0/19	0/21	0/40
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxM2	Count	0/17	0/18	0/35	dmanM2	0/23	0/20	0/43
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxM1	Count	0/17	1/16	1/33	dmanM1	0/22	0/18	0/40
	Percentage	0.0%	6.3%	3.0%		0.0%	0.0%	0.0%
dmaxC	Count	0/20	0/15	0/35	dmanC	0/15	0/13	0/28
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI2	Count	0/16	0/15	0/31	dmanI2	0/17	0/14	0/31
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI1	Count	0/11	0/14	0/25	dmanI1	0/12	0/14	0/26
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

3.2.3.5.4 Comparison

Overall, Kissonerga-*Mosphilia* displays significantly fewer teeth with carious lesions than either Souskiou-*Laona* or Lemba-*Lakkous*. There is no significant difference between Lemba-*Lakkous* and Souskiou-*Laona*[28]. Souskiou-*Laona* displays significantly more caries on both the permanent maxillary first molars (Chi Squared p=0.038) and the deciduous maxillary second molars (Chi Squared p=0.011). Lemba-*Lakkous* displays significantly more caries on the permanent mandibular first (Chi Squared p=0.005) and second molars (Chi Squared p=0.000). The rest of the teeth do not have a significant difference in expression of carious lesions across the three sites. Overall, there is no significant difference in the frequency of dental caries based on

[28] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.811, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.000 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.000.

the side that the tooth is from (Chi Squared p=0.381). The severity of the lesions varies within and across the sites, with a higher prevalence of severe caries at the settlement sites (Figure 3.77).

Figure 3.77: Right maxillary second molar from Grave 515 Skeleton A, Kissonerga-*Mosphilia* with a large carious lesion into the pulp chamber on the distal-lingual cusp (occlusal view distal side is superior and buccal side is to the right).

3.2.3.6 Linear Enamel Hypoplasias (LEH)

3.2.3.6.1 Souskiou-Laona[29]

Table 3.102 presents the percentage of LEH observed based on tooth type and side. In general, LEH are observed on 3.0% of the maxillary teeth and 1.6% of the mandibular teeth from Souskiou-*Laona*. The higher prevalence of LEH on the maxillary teeth represents a statistically significant difference between the upper and lower teeth in regards to the occurrence of LEH (Chi Squared p=0.041, Cramer's V=4.9%). There is no significant difference in LEH expression based on side within a jaw (Table 3.101). The severity of the hypoplastic line in the enamel varies from a thin shallow line to a rather wide and deep groove in the enamel. Several teeth also display more than one hypoplastic line per tooth crown.

Table 3.101: Percentage of teeth with LEH from each side based on jaw

Jaw	Left	Right	Chi Squared
Maxilla	40.0 (n=10)	60.0 (n=15)	p=0.322
Mandible	35.7 (n=5)	64.3 (n=9)	p=0.352

[29] This current analysis of the occurrence of LEH on all the dentition supersedes previous analyses which were conducted on only the canine teeth for a Master's dissertation (Gamble 2007, unpublished). There are some differences in the results in regards to the canine teeth, namely a higher percentage of canines display LEH in the Masters research, which can only be attributed to earlier errors and continually improving observational skills of the examiner.

None of the deciduous teeth display LEH. Therefore, the comparison of expression of LEH at Souskiou-*Laona* is focussed on the permanent teeth. In general, LEH occurs on all the permanent tooth types at Souskiou-*Laona*. The maxillary left first premolar and the mandibular right canine display the highest percentage of teeth with LEH by tooth position for their respective jaws. With regard to tooth type, the permanent canines display the highest percentage of LEH. There is no statistically significant difference in the expression of LEH across the maxillary tooth types (Chi Squared p=0.062). However, the permanent mandibular canines display significantly more LEH than the other mandibular teeth (Chi Squared p=0.004, Cramer's V=15.9%).

Table 3.102: Percentage of teeth with LEH by tooth type and side at Souskiou-*Laona*

Tooth		**Left**	**Right**	**Total**	**Tooth**	**Left**	**Right**	**Total**
maxM3	Count	1/26	2/40	3/66	manM3	0/43	1/47	1/90
	Percentage	3.8%	5.0%	4.5%		0.0%	2.1%	1.1%
maxM2	Count	0/55	0/49	0/104	manM2	1/66	1/74	2/140
	Percentage	0.0%	0.0%	0.0%		1.5%	1.4%	1.4%
maxM1	Count	2/53	4/52	6/105	manM1	0/56	2/67	2/123
	Percentage	3.8%	7.7%	6.7%		0.0%	3.0%	1.6%
maxPM2	Count	0/53	1/60	1/113	manPM2	1/48	0/55	1/104
	Percentage	0.0%	1.7%	0.9%		2.1%	0.0%	1.0%
maxPM1	Count	4/45	3/52	7/97	manPM1	0/50	1/58	1/108
	Percentage	8.9%	5.8%	7.2%		0.0%	1.7%	0.9%
maxC	Count	1/51	2/47	3/98	manC	3/50	4/50	7/100
	Percentage	2.0%	4.3%	3.1%		6.0%	8.0%	7.0%
maxI2	Count	1/57	1/47	2/104	manI2	0/40	0/50	0/90
	Percentage	1.8%	2.1%	1.9%		0.0%	0.0%	0.0%
maxI1	Count	1/44	2/44	3/88	manI1	0/43	0/38	0/81
	Percentage	2.3%	4.5%	3.4%		0.0%	0.0%	0.0%
dmaxM2	Count	0/5	0/7	0/12	dmanM2	0/11	0/9	0/20
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxM1	Count	0/7	0/5	0/12	dmanM1	0/14	0/10	0/24
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxC	Count	0/5	0/4	0/9	dmanC	0/6	0/4	0/10
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI2	Count	0/4	0/2	0/6	dmanI2	0/2	0/2	0/4
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI1	Count	0/5	0/5	0/10	dmanI1	0/1	0/1	0/2
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

3.2.3.6.2 Lemba-Lakkous

Table 3.104 presents the percentages of the LEH observed on the teeth of Lemba-*Lakkous*, based on tooth type and side. In general, LEH are observed on 1.7% of the maxillary teeth and 2.1% of the mandibular teeth from Lemba-*Lakkous*. There is no statistically significant difference between the upper and lower teeth in regards to the occurrence of LEH at Lemba-*Lakkous* (Chi Squared p=0.698). There is no significant difference of expression of LEH based on the side of the tooth within the jaws (Table 3.103). The severity of the hypoplastic line in the enamel varies though is typically quite mild. Several teeth also display more than one hypoplastic line per tooth crown.

Table 3.103: Percentage of teeth with LEH from each side based on jaw

Jaw	**Left**	**Right**	**Chi Squared**
Maxilla	50.0 (n=2)	50.0 (n=2)	p=0.934
Mandible	60.0 (n=3)	40.0 (n=2)	p=0.766

None of the deciduous teeth at Lemba-*Lakkous* display LEH and therefore will not be included in the analysis. In general, the permanent anterior teeth display the only examples of LEH from Lemba-*Lakkous*. Both the maxillary and mandibular permanent canines display the highest percentage of teeth with LEH by tooth position and tooth type for their respective jaws. There is no statistically significant difference in the expression of LEH based on tooth position of the maxillary teeth (Chi Squared p=0.172). However, the mandibular canines display significantly more LEH than any of the other mandibular teeth (Chi Squared p=0.000, Cramer's V=47.6%).

Table 3.104: Percentage of teeth with LEH by tooth type and side at Lemba-*Lakkous*

Tooth		**Left**	**Right**	**Total**	**Tooth**	**Left**	**Right**	**Total**
maxM3	Count	0/4	0/4	0/8	manM3	0/7	0/7	0/14
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxM2	Count	0/12	0/12	0/24	manM2	0/10	0/12	0/22
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxM1	Count	0/17	0/17	0/34	manM1	0/17	0/17	0/34
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxPM2	Count	0/13	0/9	0/22	manPM2	0/9	0/7	0/16
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxPM1	Count	0/14	0/10	0/24	manPM1	0/10	0/9	0/19
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxC	Count	1/13	1/12	2/25	manC	3/12	2/8	5/20
	Percentage	7.7%	8.3%	8.0%		25.0%	25.0%	25.0%
maxI2	Count	0/11	0/10	0/21	manI2	0/10	0/10	0/20
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxI1	Count	1/14	1/14	2/28	manI1	0/13	0/9	0/22
	Percentage	7.1%	7.1%	7.1%		0.0%	0.0%	0.0%
dmaxM2	Count	0/7	0/10	0/17	dmanM2	0/9	0/7	0/16
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxM1	Count	0/5	0/6	0/11	dmanM1	0/10	0/6	0/16
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

Tooth		Left	Right	Total	Tooth	Left	Right	Total
dmaxC	Count	0/8	0/6	0/14	dmanC	0/9	0/6	0/15
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI2	Count	0/4	0/1	0/5	dmanI2	0/6	0/6	0/12
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI1	Count	0/4	0/5	0/9	dmanI1	0/3	0/5	0/8
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

3.2.3.6.3 Kissonerga-Mosphilia

Table 3.106 presents the percentage of teeth with LEH at Kissonerga-*Mosphilia*, by tooth type and side. In general, LEH are observed on 3.6% of the maxillary teeth and 4.2% of the mandibular teeth from Kissonerga-*Mosphilia*. There is no statistically significant difference in the expression of LEH between the upper and lower teeth at Kissonerga-*Mosphilia* (Chi Squared p=0.655). Nor is there a significant difference in LEH expression based on side within the jaws (Table 3.105). The severity of the hypoplastic line in the enamel varies though it is typically quite mild. Several teeth display more than one hypoplastic line per tooth crown.

Table 3.105: Percentage of teeth with LEH from each side based on jaw

Jaw	Left	Right	Chi Squared
Maxilla	44.4 (n=8)	55.6 (n=10)	p=0.547
Mandible	55.0 (n=11)	45.0 (n=9)	p=0.797

None of the deciduous teeth at Kissonerga-*Mosphilia* display LEH and therefore will not be included in the analysis. In general, the permanent anterior teeth at Kissonerga-*Mosphilia* display higher frequencies of LEH than the posterior teeth. Both the maxillary and mandibular permanent canines display the highest percentage of teeth with LEH by tooth position and tooth type for their respective jaws. The permanent maxillary canines and central incisors display significantly higher percentages of LEH by tooth than the other maxillary teeth (Chi Squared p=0.000, Cramer's V=30.8%). As well, the permanent mandibular canines display significantly more LEH by tooth than any of the other mandibular teeth (Chi Squared p=0.000, Cramer's V=40.9%).

Table 3.106: Percentage of teeth with LEH by tooth type and side at Kissonerga-*Mosphilia*

Tooth		Left	Right	Total	Tooth	Left	Right	Total
maxM3	Count	0/11	0/15	0/26	manM3	0/11	0/9	0/20
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxM2	Count	0/25	0/18	0/43	manM2	0/23	0/24	0/47
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

Tooth		Left	Right	Total	Tooth	Left	Right	Total
maxM1	Count	0/29	1/25	1/54	manM1	0/33	0/28	0/61
	Percentage	0.0%	4.0%	1.9%		0.0%	0.0%	0.0%
maxPM2	Count	0/25	0/20	0/45	manPM2	0/13	2/14	2/27
	Percentage	0.0%	0.0%	0.0%		0.0%	14.3%	7.4%
maxPM1	Count	1/20	1/19	2/39	manPM1	2/19	0/16	2/35
	Percentage	5.0%	5.3%	5.1%		10.5%	0.0%	5.7%
maxC	Count	4/21	4/17	8/38	manC	7/21	6/21	13/42
	Percentage	19.0%	23.5%	21.1%		33.3%	28.6%	31.0%
maxI2	Count	0/21	1/23	1/44	manI2	1/22	1/17	2/39
	Percentage	0.0%	4.3%	2.3%		4.5%	5.9%	5.1%
maxI1	Count	3/22	3/26	6/48	manI1	1/19	0/21	1/40
	Percentage	13.6%	11.5%	12.5%		5.3%	0.0%	2.5%
dmaxM2	Count	0/17	0/18	0/35	dmanM2	0/23	0/20	0/43
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxM1	Count	0/17	0/16	0/33	dmanM1	0/22	0/18	0/40
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxC	Count	0/20	0/15	0/35	dmanC	0/15	0/13	0/28
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI2	Count	0/16	0/15	0/31	dmanI2	0/17	0/14	0/31
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI1	Count	0/11	0/14	0/25	dmanI1	0/12	0/14	0/26
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

3.2.3.6.4 Comparison

Overall, Kissonerga-*Mosphilia* displays a significantly higher percentage of teeth with LEH than Souskiou-*Laona*. There is no significant difference in LEH expression between Lemba-*Lakkous* and Souskiou-*Laona* and Lemba-*Lakkous* and Kissonerga-*Mosphilia*[30]. The deciduous teeth could not be compared as none display LEH. Kissonerga-*Mosphilia* displays a significantly higher percentage of LEH on the maxillary canines than Souskiou-*Laona (*Chi Squared p=0.003). Both Kissonerga-*Mosphilia* and Lemba-*Lakkous* display a significantly higher percentage of LEH than Souskiou-*Laona* on the mandibular canines (Chi Squared p=0.001). The rest of the permanent teeth do not have a significant difference in expression of LEH across the three sites. Overall, there is no significant difference in the frequency of LEH based on the side that the tooth is from (Chi Squared p=0.528). In general, the hypoplastic grooves observed on the teeth across all three sites are typically quite mild (Figure 2.11 and see Figure 3.78 for a more severe LEH).

[30] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.898, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.033 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.070.

Figure 3.78: Left maxillary permanent canine tooth from Tomb 125 Quadrant 1 commingled skeletal material from Souskiou-*Laona* displays a fairly severe hypoplastic line in the cervical third of the crown as indicated by the arrow (mesial view, anterior aspect to the right).

3.2.3.7 Attrition

3.2.3.7.1 Souskiou-Laona

Table 3.108 presents the percentage of teeth displaying attrition based on tooth type and side. In general, heavy attrition is observed on 6.4% of the maxillary teeth and 3.1% of the mandibular teeth from Souskiou-*Laona*. The maxillary teeth at Souskiou-*Laona* display a significantly higher frequency of attrition than the mandibular teeth (Chi Squared p=0.001, Cramer's V=7.8%). However, there is no statistically significant difference in the occurrence of attrition based on side for each jaw (Table 3.107). There does not seem to be evidence for retained deciduous teeth as none of the deciduous teeth are heavily worn. Therefore, the comparison of occurrence of heavy attrition is focussed on the permanent teeth.

Table 3.107: Percentage of teeth by jaw and side with attrition

Jaw	Left	Right	Chi Squared
Maxilla	47.2 (n=25)	52.8 (n=28)	p=0.679
Mandible	50.0 (n=14)	50.0 (n=14)	p=0.833

In general, attrition was observed on all the permanent tooth types at Souskiou-*Laona*, with particular emphasis on the premolars and molars. The maxillary right first molar and the mandibular left first molar display the highest percentage of heavily worn teeth by tooth position for their respective jaws. In regards to tooth type, the permanent first molars display the highest percentage of teeth with attrition. The maxillary first molars and second premolars display significantly more teeth with heavy attrition than the other maxillary teeth (Chi Squared p=0.008, Cramer's V=15.7%). The permanent mandibular first and second molars display significantly more heavily worn teeth than the other mandibular teeth (Chi Squared p=0.048, Cramer's V=13.0%).

Table 3.108: Percentage of teeth with attrition by tooth type and side at Souskiou-*Laona*

Tooth		**Left**	**Right**	**Total**	**Tooth**	**Left**	**Right**	**Total**
maxM3	Count	1/26	2/40	3/66	manM3	2/43	0/47	3/90
	Percentage	3.8%	5.0%	4.5%		4.7%	0.0%	2.2%
maxM2	Count	2/55	1/49	3/104	manM2	3/66	4/74	7/140
	Percentage	3.6%	2.0%	2.9%		4.5%	5.4%	5.0%
maxM1	Count	6/53	11/52	17/105	manM1	5/56	5/67	10/123
	Percentage	11.3%	21.2%	16.2%		8.9%	7.5%	8.1%
maxPM2	Count	5/53	4/60	9/113	manPM2	0/48	2/55	2/104
	Percentage	9.4%	6.7%	8.0%		0.0%	3.6%	1.9%
maxPM1	Count	2/45	3/52	5/97	manPM1	0/50	2/58	2/108
	Percentage	4.4%	5.8%	5.2%		0.0%	3.4%	1.9%
maxC	Count	3/51	3/47	6/98	manC	3/50	0/50	3/100
	Percentage	5.9%	6.4%	6.1%		6.0%	0.0%	3.0%
maxI2	Count	4/57	1/47	5/104	manI2	1/40	0/50	1/90
	Percentage	7.0%	2.1%	4.8%		2.5%	0.0%	1.1%
maxI1	Count	2/44	3/44	5/88	manI1	0/43	1/38	1/81
	Percentage	4.5%	6.8%	5.7%		0.0%	2.6%	1.2%
dmaxM2	Count	0/5	0/7	0/12	dmanM2	0/11	0/9	0/20
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxM1	Count	0/7	0/5	0/12	dmanM1	0/14	0/10	0/24
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxC	Count	0/5	0/4	0/9	dmanC	0/6	0/4	0/10
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI2	Count	0/4	0/2	0/6	dmanI2	0/2	0/2	0/4
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI1	Count	0/5	0/5	0/10	dmanI1	0/1	0/1	0/2
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

3.2.3.7.2 Lemba-Lakkous

Table 3.110 presents the percentage of heavily worn teeth at Lemba-*Lakkous* by tooth type and side. In general, heavy attrition is observed on 6.2% of the maxillary teeth and 5.1% of the mandibular teeth from Lemba-*Lakkous*. There is no statistically significant difference in the occurrence of heavily worn teeth between the maxillary and mandibular teeth at Lemba-*Lakkous* (Chi Squared p=0.614). Nor is there a significant difference between the expression of attrition based on side within the jaws (Table 3.109).

Table 3.109: Percentage of teeth by jaw and side with attrition

Jaw	Left	Right	Chi Squared
Maxilla	53.3 (n=8)	46.7 (n=7)	p=0.919
Mandible	58.3 (n=7)	41.7 (n=5)	p=0.726

There is no evidence of retained deciduous dentition as none of the deciduous teeth are heavily worn. Therefore, the comparison of teeth with heavy attrition is focussed on the permanent teeth. In general, attrition was observed predominately on the premolars and molars from Lemba-*Lakkous*. The maxillary left second premolar and the mandibular left first molar display the highest percentage of heavily worn teeth by tooth position for their respective jaws. In regards to tooth type, the permanent second premolars display the highest percentage of teeth with attrition. The maxillary first and second premolars display heavy attrition, significantly more often than the other maxillary tooth types (Chi Squared p=0.007, Cramer's V=32.3%). There is no statistically significant difference in the occurrence of attrition on the mandibular teeth despite the slightly higher occurrence of attrition on the first molars (Chi Squared p=0.421).

Table 3.110: Percentage of teeth with attrition by tooth type and side at Lemba-*Lakkous*

Tooth		Left	Right	Total	Tooth	Left	Right	Total
maxM3	Count	0/4	0/4	0/8	manM3	1/7	0/7	1/14
	Percentage	0.0%	0.0%	0.0%		14.3%	0.0%	7.1%
maxM2	Count	0/12	0/12	0/24	manM2	1/10	0/12	1/22
	Percentage	0.0%	0.0%	0.0%		10.0%	0.0%	4.5%
maxM1	Count	1/17	2/17	3/34	manM1	3/17	2/17	5/34
	Percentage	5.9%	11.8%	8.8%		17.6%	11.8%	14.7%
maxPM2	Count	4/13	2/9	6/22	manPM2	1/9	1/7	2/16
	Percentage	30.8%	22.2%	27.3%		11.1%	14.3%	12.5%
maxPM1	Count	2/14	2/10	4/24	manPM1	0/10	0/9	0/19
	Percentage	14.3%	20.0%	16.7%		0.0%	0.0%	0.0%
maxC	Count	0/13	0/12	0/25	manC	0/12	0/8	0/20
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxI2	Count	1/11	0/10	1/21	manI2	0/10	1/10	1/20
	Percentage	9.1%	0.0%	4.8%		0.0%	10.0%	5.0%
maxI1	Count	0/14	1/14	1/28	manI1	1/13	1/9	2/22
	Percentage	0.0%	7.1%	3.6%		7.7%	11.1%	9.1%
dmaxM2	Count	0/7	0/10	0/17	dmanM2	0/9	0/7	0/16
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxM1	Count	0/5	0/6	0/11	dmanM1	0/10	0/6	0/16
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxC	Count	0/8	0/6	0/14	dmanC	0/9	0/6	0/15
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

Tooth		Left	Right	Total	Tooth	Left	Right	Total
dmaxI2	Count	0/4	0/1	0/5	dmanI2	0/6	0/6	0/12
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI1	Count	0/4	0/5	0/9	dmanI1	0/3	0/5	0/8
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

3.2.3.7.3 Kissonerga-Mosphilia

Table 3.112 presents the percentage of teeth with attrition at Kissonerga-*Mosphilia* by tooth type and side. In general, heavy attrition was observed on 2.4% of the maxillary teeth and 2.9% of the mandibular teeth from Kissonerga-*Mosphilia*. There is no statistically significant difference in the occurrence of heavily worn teeth between the maxillary and mandibular teeth (Chi Squared p=0.622). Nor is there a statistically significant difference in the occurrence of attrition based on side for either jaw (Table 3.111). Two deciduous mandibular second molars and two deciduous mandibular first molars are heavily worn.

Table 3.111: Percentage of teeth by jaw and side with attrition

Jaw	Left	Right	Chi Squared
Maxilla	58.3 (n=7)	41.7 (n=5)	p=0.627
Mandible	71.4 (n=10)	28.6 (n=4)	p=0.144

These may represent retained deciduous teeth or particular activities which have worn these teeth down mainly distally and buccally. Three individuals are affected, all aged as ‘child’, from Graves 567, 529 and 566. These are the only four deciduous teeth within all three skeletal samples that display heavy attrition, therefore the comparison of occurrence of heavy attrition at Kissonerga-*Mosphilia* is focussed on the permanent teeth. In general, there are low frequencies of heavily worn teeth for all the tooth groups at Kissonerga-*Mosphilia*. The maxillary right first premolar and the mandibular right first molar display the highest percentage of heavily worn teeth by tooth position for their respective jaws. In regards to tooth type, the permanent canines display the highest percentage of teeth with attrition. There is no statistically significant difference in the frequency of occurrence of attrition across the different tooth types of maxilla or the mandible (Chi Squared p=0.511 and p=0.527 respectively).

Table 3.112: Percentage of teeth with attrition by tooth type and side at Kissonerga-*Mosphilia*

Tooth		Left	Right	Total	Tooth	Left	Right	Total
maxM3	Count	0/11	0/15	0/26	manM3	0/11	0/9	0/20
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
maxM2	Count	0/25	1/18	1/43	manM2	0/23	0/24	0/47
	Percentage	0.0%	5.6%	2.3%		0.0%	0.0%	0.0%
maxM1	Count	0/29	1/25	1/54	manM1	2/33	2/28	4/61
	Percentage	0.0%	4.0%	1.9%		6.1%	7.1%	6.6%
maxPM2	Count	1/25	1/20	2/45	manPM2	0/13	0/14	0/27
	Percentage	4.0%	5.0%	4.4%		0.0%	0.0%	0.0%
maxPM1	Count	1/20	2/19	3/39	manPM1	1/19	0/16	1/35
	Percentage	5.0%	10.5%	7.7%		5.3%	0.0%	2.9%
maxC	Count	3/21	0/17	3/38	manC	2/21	0/21	2/42
	Percentage	14.3%	0.0%	7.9%		9.5%	0.0%	4.8%
maxI2	Count	1/21	0/23	1/44	manI2	1/22	0/17	1/39
	Percentage	4.8%	0.0%	2.3%		4.5%	0.0%	2.6%
maxI1	Count	1/22	0/26	1/48	manI1	1/19	1/21	2/40
	Percentage	4.5%	0.0%	2.1%		5.3%	4.8%	5.0%
dmaxM2	Count	0/17	0/18	0/35	dmanM2	1/23	1/20	2/43
	Percentage	0.0%	0.0%	0.0%		4.3%	5.0%	4.7%
dmaxM1	Count	0/17	0/16	0/33	dmanM1	2/22	0/18	2/40
	Percentage	0.0%	0.0%	0.0%		9.1%	0.0%	5.0%
dmaxC	Count	0/20	0/15	0/35	dmanC	0/15	0/13	0/28
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI2	Count	0/16	0/15	0/31	dmanI2	0/17	0/14	0/31
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
dmaxI1	Count	0/11	0/14	0/25	dmanI1	0/12	0/14	0/26
	Percentage	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

3.2.3.7.4 Comparison

Overall, Souskiou-*Laona* and Lemba-*Lakkous* display a significantly higher percentage of teeth with heavy attrition than Kissonerga-*Mosphilia*. There is no significant difference in the frequency of occurrence between Souskiou-*Laona* and Lemba-*Lakkous*[31]. Lemba-*Lakkous* displays a significantly higher percentage of teeth with heavy attrition on the maxillary and mandibular second premolars than Souskiou-*Laona* and Kissonerga-*Mosphilia* (Chi Squared p=0.002 and p=0.034 respectively). This may represent an age-related change or possible a non-alimentary use of the teeth. Souskiou-*Laona* displays a higher percentage of maxillary first molars with heavy attrition than the two settlement sites (Chi Squared p=0.021). This

[31] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.623, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.030 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.020.

may represent an age-related change to the teeth. The rest of the permanent teeth do not have a significant difference in occurrence of attrition based on tooth type across the three sites and none of the deciduous teeth display a significant difference in occurrence of attrition. Overall, there is no significant difference in the frequency of occurrence of heavily worn teeth based on the side from which the tooth is located (Chi Squared p=0.770). For examples of heavy attrition see Figures 2.13 and 3.42.

3.2.3.8 Indeterminate Dentition

This subgroup of the dentition represents the teeth which could not be identified, either by a side, tooth group or location. Table 3.113 provides the percentage of indeterminate teeth which were assessed.

Figure 3.79: Odontome tooth from Kissonerga-*Mosphilia* Grave 550 (occlusal view)

Table 3.113: Indeterminate teeth assessed for all three sites

Assessment Possible?	**Count**	**Percent**
CBA	108	90.8
Abnormal	6	5.0
No pathology	5	4.2
Total	119	100.0

Within the abnormal section, two teeth exhibit very heavy attrition, two are peg-shaped supernumerary teeth, one has an unusual morphological variation and one is an odontome (Figure 3.79). These unusual teeth were loose and could not be placed in the dental arc. The odontome is from the adult from Grave 550 from Kissonerga-*Mosphilia* and is a large mass of enamel which shows possible evidence of wear on one aspect. The tooth with unusual morphological variation was located within Grave 505, Skeleton A from Kissonerga-*Mosphilia*. It is a molariform with many cusps, two large and two small roots and a large dip in the root and crown along one side. One supernumerary peg-shaped tooth comes from Tomb 159 Bonestack, Souskiou-*Laona* and the other from the young adult from Grave 40, Lemba-*Lakkous* and both appear to be worn on the crown.

3.2.4 Cervical vertebrae

The fragmentary nature of the bone makes it impossible to provide a secure minimum number of cervical vertebrae examined. In general, the pathologies affecting the third through seventh cervical vertebrae are exclusively related to osteoarthritic changes of the bodies and facets. These osteoarthritic changes predominately occur as osteophytic growth on the anterior margin of the body of the vertebrae and extension, porosity and osteophytic growth of the articular facets and will be discussed on a burial by burial basis. The axis and atlas are examined separately as there is only one per skeleton and they can be discussed in a quantifiable way.

3.2.4.1 Souskiou-Laona

Of the cervical vertebrae examined from all three sites, 59.1% are derived from Souskiou-*Laona*. The pathologies affecting both the atlas (C-1) and axis (C-2) are exclusively osteoarthritic changes, predominately in the form of osteophytic growth. Subadult skeletal material from Souskiou-*Laona* is not included within this analysis. Table 3.114 provides the percentage of first and second cervical vertebrae with pathology.

Table 3.114: Percentage of adult cervical vertebrae from Souskiou-*Laona* and pathologies

Cervical Vertebrae	**Count**	**Percent**	**Osteoarthritic changes**	**Percent**
Atlas	77	32.6	5	6.5
Axis	59	25.0	12	20.3
C3-C7 vertebrae/ groups	100	42.4	See mortuary feature analyses below	
Total	236	100.0	17	7.2

The C-1 vertebrae from Cranium G Tomb 125, Bonestack E Tomb 158, commingled C Tomb 158 and the Bonestack of Tomb 228 display extension of the articular facet for the dens with osteophytic growth around the margins of the facet (Figure 3.80). The superior articular facet of the atlas from Skeleton A Tomb 192 has a bone ridge in the middle of the right facet. Table 3.115 presents the percentage of C-1 vertebrae with osteoarthritic changes based on assessed sex, where it was possible to do so.

Table 3.115: Percentage of first cervical vertebrae with osteoarthritic changes based on sex

Sex	**Count Present**	**Count with Pathology**	**Percent**
Male	6	0	0.0
Female	12	1	8.3

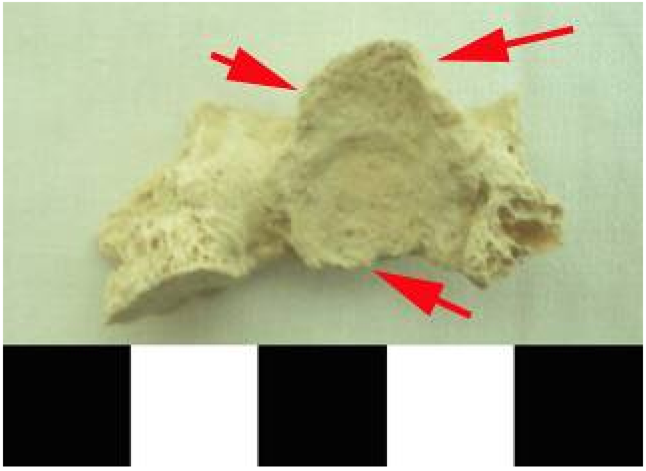


Figure 3.80: Osteoarthritic changes to the dens facet of the first cervical vertebra from Souskiou-*Laona* Tomb 228 Bonestack with bone growth and extension of the facet as indicated by the arrows (posterior view, superior aspect is up).

Osteoarthritic changes are the only pathological lesion observed on the C-2 vertebrae, predominately affecting the dens (above Table 3.114). In many cases, the dens displays a small osteophyte on the superior aspect, projecting superiorly[32] (i.e. Figures 3.26, 3.50, 3.81). The axis from Cranium B Tomb 159 displays a lateral extension with bone growth of the anterior facet on the dens. An axis from Bonestack B Tomb 220 displays not only an osteophyte on the superior aspect, but also a groove on the posterior side of the dens at its base with sharp bone growth at the margins, most likely caused by the transverse ligament (Figure 3.82). An axis from the Bonestack of Tomb 228 displays an osteophyte on the superior aspect of the dens, extension of the anterior facet with the atlas on the dens and bone growth on the inferior-anterior aspect of the body. Table 3.116 presents the percentage of axes with osteoarthritic changes based on sex determination, where it was possible.

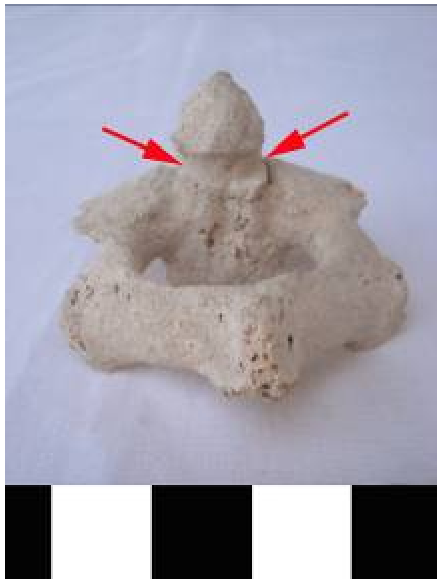
Table 3.116: Percentage of second cervical vertebrae with osteoarthritic changes based on sex

Sex	**Count Present**	**Count with Pathology**	**Percent**
Male	6	1	16.7
Female	7	1	14.3

[32] The axes affected are from: Bonestack E Tomb 158, Bonestack Tomb 159, commingled Tomb 168, Skeleton A Tomb 189, Bonestack B Tomb 220, Bonestack Tomb 228 (2 cases), Cranium G Tomb 125 and commingled C Tomb 158.

Figure 3.81: (Below left) Osteophyte on the superior aspect of the dens of a second cervical vertebra as indicated by the arrow from Lemba-*Lakkous* Grave 30 (posterior view).

Figure 3.82: (Below right) Groove in the dens of a second cervical vertebra due to the transverse ligament as indicated by the arrows from Souskiou-*Laona* Tomb 220 (posterior view).



3.2.4.2 Lemba-Lakkous

Of the all cervical vertebrae examined, 17.7% are derived from Lemba-*Lakkous*. Osteoarthritic changes are the only pathological lesions observed on the cervical vertebrae, predominately in the form of osteophytic growth. Table 3.117 provides the overall percentage of first and second cervical vertebrae with pathology.

Table 3.117: Percentage of cervical vertebrae from Lemba-*Lakkous* and pathologies

Cervical Vertebrae	**Count**	**Percent**	**Osteoarthritic changes**	**Percent**
Atlas	24	31.6	5	20.8
Axis	20	26.3	5	25.0
C3-C7 vertebrae/ groups	32	42.1	See mortuary feature analyses below	
Total	76	100.0	10	13.2

Table 3.118: Percentage of atlas' with osteoarthritic changes by age

Age	**Count Present**	**Count with OA**	**Percent**
Subadult	14	1	7.1
Adult	10	4	40.0

All five C-1 vertebrae which display pathology, do so in the form of osteophytic growth on the margins of the articular facet for the dens of the axis, reflecting a mal-articulation (see Figure 3.80 for an example)[33]. Table 3.118 presents the percentage of adult and subadult C-1 vertebrae with osteoarthritic changes and Table 3.119 provides the percentage of male and female C-1 vertebrae with osteoarthritic changes. The subadult atlas from Grave 33 is from an older adolescent, with inferior bony extension of the dens facet.

Table 3.119: Percentage of first cervical vertebrae with osteoarthritic changes based on sex

Sex	Count Present	Count with Pathology	Percent
Male	3	1	33.3
Female	7	3	42.9

The dens is the most frequently affected aspect, with all five of the C-2 vertebrae with pathology displaying osteophytic growth on the superior aspect of the dens (see Figures 3.36, 3.50 and 3.81 for examples)[34]. As well as an osteophyte on the superior aspect of the dens, the axis from Grave 26 also displays bony growth on the margins of anterior facet of the dens with some porosity.

Table 3.120: Percentage of axes with osteoarthritic changes by age

Age	Count Present	Count with OA	Percent
Subadult	11	1	9.1
Adult	9	4	44.4

Table 3.120 presents the percentage of axes with pathology by age and Table 3.121 provides the percentage of axes with pathology by sex determination. Grave 33 contains the subadult axis, an older adolescent, with a very small osteophyte on the superior aspect of the dens.

Table 3.121: Percentage of second cervical vertebrae with osteoarthritic changes based on sex at Lemba-*Lakkous*

Sex	Count Present	Count with Pathology	Percent
Male	3	3	100.0
Female	6	1	16.7

3.2.4.3 Kissonerga-Mosphilia

Of the all cervical vertebrae examined, 23.3% are derived from Kissonerga-*Mosphilia*. Osteoarthritic changes are the only pathological lesions observed on the

[33] Adult atlas' with osteoarthritic changes to the dens facet from Lemba-*Lakkous*: Grave 22, Grave 23, Grave 30 and Grave 35.

[34] Adult axes with osteophytic growth on the superior aspect of the dens: Grave 22, Grave 26, Grave 30 and Grave 53.

cervical vertebrae, predominately in the form of osteophytic growth. Table 3.122 provides the overall percentage of first and second cervical vertebrae with pathology.

Table 3.122: Percentage of cervical vertebrae from Kissonerga-*Mosphilia* and pathologies

Cervical Vertebrae	**Count**	**Percent**	**Osteoarthritic changes**	**Percent**
Atlas	27	27.0	1	3.7
Axis	26	26.0	3	11.5
C3-C7 vertebrae/ groups	47	47.0	See mortuary feature analyses below	
Total	100	100.0	4	4.0

Table 3.123: Percentage of atlas' and axes with osteoarthritic changes by age

Age	**Atlas**			**Axes**		
	Count Present	**Count with OA**	**Percent**	**Count Present**	**Count with OA**	**Percent**
Subadult	16	1	6.3	15	0	0.0
Adult	11	0	0.0	11	3	27.3

Table 3.123 provides the percentage of C-1 vertebrae with osteoarthritic changes by age. The adolescent atlas from Grave 535 displays mild osteophytic growth on the inferior left articular facet, reflecting a possible mal-articulation with the axis (see Figure 3.46 above).

Figure 3.83: Osteophyte on the superior aspect of the dens with some mild porosity as indicated by the arrow from Kissonerga-*Mosphilia* Grave 571 (anterior view)

None of the subadult C-2 vertebrae derived from Kissonerga-*Mosphilia* display evidence of pathology (Table 3.123). The dens is affected in two of the three cases of osteoarthritic changes to the axes (above Table 3.122). The axis of the young adult from Grave 526 displays a small (2mm) osteophyte on the superior aspect of the dens. The axis of the adult from Grave 571 displays not only an osteophyte on the superior aspect of the dens, but mild porosity of the dens (Figure 3.83). The third axis, from a young adult from Grave 505 Skeleton B, displays osteophytic growth on the anterior margin of the inferior aspect of the body. Over half (57.7%

(n=15)) of the C-2 vertebrae observed belong to subadults, none of which display any pathology. Table 3.124 provides the percentage of adult C-2 vertebrae with osteoarthritic changes by sex.

Table 3.124: Percentage of second cervical vertebrae with osteoarthritic changes based on sex at Kissonerga-*Mosphilia*

Sex	**Count Present**	**Count with Pathology**	**Percent**
Male	3	0	0.0
Female	7	3	42.9
Total Adult axes	11	3	27.3

3.2.4.4 Comparison

Lemba-*Lakkous* does display a higher percentage of C-1 vertebrae with osteoarthritic changes, though it does not prove to be a statistically significant difference when compared to the other two sites[35]. There is no statistically significant difference between the sexes in regards to pathological expression on the atlas across the three sites (Chi Squared p=0.345). The most common pathology across the sites affecting the atlas is extension and osteophytic growth of the dens facet. This is likely due to regular wear and tear on the joint which allows for the right-left rotation of the head (Genez *et al.* 1990; Zapletal *et al.* 1995, 1997).

There is no statistically significant difference in the expression of pathology on the C-2 vertebrae amongst the three sites[36]. Once again, Lemba-*Lakkous* displays the highest percentage of pathology of the axis. There is no statistical significant difference between the sexes in regards to pathological expression on the axis across the three sites (Chi Squared p=0.234). The most common pathology observed on the axis is osteophytic growth on the superior aspect of the dens. This osteophyte is likely due to calcification of the apical ligament and is usually associated with minor osteoarthritic changes with the cranium (Zapletal 1997: 355), though it would have been relatively asymptomatic and had little effect on the individuals. Overall, as is expected, the youngest individuals to display any osteoarthritic changes to the atlas or axis are

[35] Oneway ANOVA for all three sites p=0.044 - Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.055, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.917 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.068.

[36] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.859, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.651 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.484.

adolescents and other than the C-1 vertebrae at Kissonerga-*Mosphilia*, adults consistently display more pathology to the atlas and axis vertebrae.

In regards to representativeness of the samples of the atlas and axis presented here, Souskiou-*Laona* has the greatest rate of recovery of these bones in comparison to the overall MNI[37]. This is likely due to the burial practices in use at each site (which will be elaborated on in Chapter Four). The only pathology observed reflects osteoarthritic changes to the vertebrae. There is no evidence of metabolic disorders, infectious or metabolic diseases, trauma, congenital pathologies or infection on any of the cervical vertebrae.

3.2.5 Thoracic vertebrae

The thoracic vertebrae were highly fragmentary and thus establishing a secure number of vertebrae present is impossible, hence all analysis will be dealt with burial by burial in section three of this chapter. Table 3.125 presents the percentage of thoracic vertebrae fragments or groups derived from each site.

Table 3.125: Percentage of thoracic vertebrae records from each site

Site	**Count**	**Percent**
Souskiou-*Laona*	179	71.3
Lemba-*Lakkous*	29	11.6
Kissonerga-*Mosphilia*	43	17.1
Total	251	100.0

In general, osteoarthritic changes are predominately the pathological lesions observed, almost exclusively in the form of osteophytic growth of the articular facets or the anterior portion of the bodies. There is no evidence of metabolic disorders, infectious or metabolic diseases, trauma, congenital pathologies or infection on any of the thoracic vertebrae.

3.2.6 Lumbar vertebrae

The lumbar vertebrae were highly fragmentary and thus establishing a secure number of vertebrae present is impossible, hence all analysis will be dealt with burial by burial

[37] When compared to the overall MNI at each site the recovery rates are as follows: Souskiou-*Laona* – 65.6% of atlas, 48.8% of axis; Lemba-*Lakkous* – 41.4% of atlas, 34.5% of axis; Kissonerga-*Mosphilia* - 33.8% of atlas, 32.5% of axis.

in section three of this chapter. Table 3.126 presents the percentage of lumbar vertebrae fragments or groups derived from each site.

Table 3.126: Percentage of lumbar vertebrae records from each site

Site	**Count**	**Percent**
Souskiou-*Laona*	95	69.3
Lemba-*Lakkous*	16	11.7
Kissonerga-*Mosphilia*	26	19.0
Total	137	100.0

As with the other vertebral elements, the pathologies observed are predominately osteoarthritic changes in the form of bony changes to the articular facets and bodies, represented by extension, osteophytes and some porosity. There is no evidence of metabolic disorders, infectious or metabolic diseases, trauma, congenital pathologies or infection on any of the lumbar vertebrae.

<u>3.2.7 Indeterminate Vertebrae</u>

The 'indeterminate' vertebrae were highly fragmentary and unidentifiable to a particular vertebra type. It is impossible to establish a secure minimum number of vertebrae present, hence all analysis will be dealt with burial by burial in section three of this chapter. Table 3.127 presents the percentage of 'indeterminate' vertebrae fragments or groups derived from each site.

Table 3.127: Percentage of 'indeterminate' vertebrae records from each site

Site	**Count**	**Percent**
Souskiou-*Laona*	134	64.7
Lemba-*Lakkous*	32	15.5
Kissonerga-*Mosphilia*	41	19.8
Total	207	100.0

Table 3.128 provides the percentage of 'indeterminate' vertebrae which were assessed. The five cases where pathology was observed, reflect bony growth on a single facet or body fragment. It is impossible to determine the extent of the pathology or any context information in regards to the particular individual to whom these fragments might belong. The only pathology observed reflects osteoarthritic changes to the spine. There is no evidence of metabolic disorders, infectious or hematopoietic diseases, trauma or congenital pathologies on any of the indeterminate vertebrae.

Table 3.128: Percentage of 'indeterminate' vertebrae records which were assessed

Assessment	Count	Percent
CBA	128	61.8
Osteoarthritic changes observed	5	2.4
No pathology	74	35.8
Total	207	100.0

3.2.8 Os coxa

3.2.8.1 Souskiou-Laona

Of all the os coxae examined from all three sites, 67.1% are derived from Souskiou-*Laona*. Table 3.129 (and Figure 3.84) presents the percentage of os coxa which were assessed for pathologies. Those that cannot be assessed are not included within the analysis. As the only pathology observed on the os coxae from Souskiou-*Laona* reflect osteoarthritic changes, none of the subadult os coxae recovered display any pathology (Table 3.130).

Table 3.129: Percentage of os coxae which were assessed

Assessment	Count	Percent
CBA	96	43.6
Osteoarthritic changes	5	2.3
No pathology	119	54.1
Totals	220	100.0

Figure 3.84: Percentage of os coxa assessed with pathology from Souskiou-*Laona*

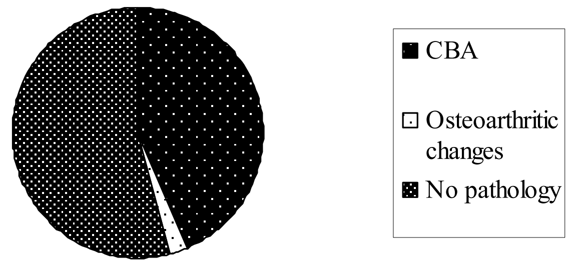


Table 3.130: Percentage of os coxae with pathology by age group from Souskiou-*Laona*

Age	Count Present	Count with OA	Percent
Subadult	11	0	0.0
Adult	95	3	3.2
CBA	18	2	11.1
Total	124	5	4.0

All five of the os coxae with pathology display osteoarthritic changes to the acetabula. There is a minimum of 83 discrete os coxae within the Souskiou-*Laona* sample[38] of

[38] The minimum number of elements for the os coxae was arrived at by cross-tabulating age and side with and overlay of burial context number. When there was uncertainty based on this criteria, the data

which 72 have a portion of the acetabulum preserved. Therefore, 6.9% of the acetabula observed display osteoarthritic changes. The left acetabulum from the Bonestack Tomb 200 displays osteophytic growth at the superior aspect with some possible porosity on the inferior surface. The left acetabulum from Bonestack A Tomb 220 displays a patch of porous new bone growth at the inferior aspect of the articular surface with changes to the general shape of the facet (Figure 3.85). The right acetabulum from Bonestack A Tomb 193 appears remodelled slightly with a flattening of the articular facet, however it is not conclusive due to the fragmentation of the os coxa. Skeleton A Tomb 201 displays osteoarthritic growth along the margin of the articular surface of the right acetabulum (Figure 3.86). While the right acetabulum from Bonestack D Tomb 220 displays osteophytic growth along the anterior-inferior margin (Figure 3.89). Table 3.131 provides the percentage of os coxae with osteoarthritic changes based on side. There is no statistically significant difference between pathological expression based on side (Chi Squared p=0.646).

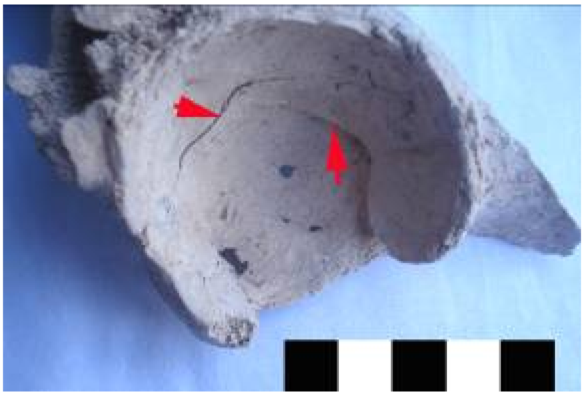


Figure 3.85: (Above left) Left acetabulum from Tomb 220 Bonestack A Souskiou-*Laona* with porosity indicated by the arrows and change to the articular surface (lateral view, anterior margin is on bottom).

Figure 3.86: (Above right) Right acetabulum from Tomb 201 Skeleton A Souskiou-*Laona* with bone growth indicated by the arrows along the superior-posterior margins (lateral view, with ischial tuberosity to the left and iliopubic ramus to the right).

Figure 3.87: (Left) Right acetabulum from Tomb 220 Bonestack D Souskiou-*Laona* with osteophytic growth along the anterior-inferior margin of the articular surface (anterior-inferior view)

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spreadsheets were consulted for a more detailed breakdown of the os coxa parts recovered and the count was based on duplicate parts.

Table 3.131: Percentage of os coxae with osteoarthritic changes based on side from Souskiou-*Laona*

Side	Count Present	Count with OA	Percent
Right	44	2	4.5
Left	44	3	6.8
Indeterminate	36	0	0.0

Table 3.132 presents the percentage of os coxae with pathology based on sex where sex determination was possible. There is no statistically significant difference based on sex (Chi Squared p=0.143).

Table 3.132: Percentage of os coxae with pathology based on sex at Souskiou-*Laona*

Sex	Count Present	Count with OA	Percent
Male	20	3	15.0
Female	14	2	14.4

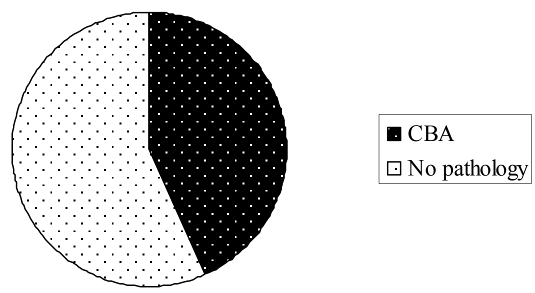
<u>*3.2.8.2 Lemba-Lakkous*</u>

Of all the ox coxae examined from all three sites, 9.1% are derived from Lemba-*Lakkous*. Table 3.133 (and Figure 3.88) presents the percentage of os coxae which were assessed for pathologies. There were no pathologies observed on any of the os coxae from Lemba-*Lakkous*.

Table 3.133: Percentage of os coxae which were assessed from Lemba-*Lakkous*

Assessment	Count	Percent
CBA	13	43.3
No pathology	17	56.7
Totals	30	100.0

Figure 3.88: Percentage of os coxa assessed from Lemba-Lakkous



There is a minimum of 24 discrete os coxae within the Lemba-*Lakkous* sample (see footnote above). Table 3.134 provides the number of os coxae within each age group and side (including those which cannot be assessed). Table 3.135 presents the number of adult os coxa based on sex determination.

Table 3.134: Number of os coxae within each age group and side

Age	Count	Percent	Left	Right	Indeterminate
Subadult	15	50.0	2	6	7
Adult	15	50.0	3	2	10
Total	30	100.0	5	8	17

Table 3.135: Number of os coxae based on sex

Sex	Count Present
Male	4
Female	10

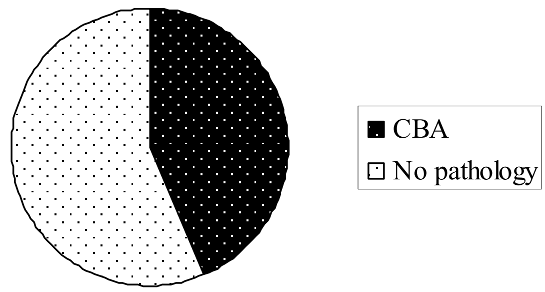
3.2.8.3 Kissonerga-Mosphilia

Of all the ox coxae examined from all three sites, 23.8% are derived from Kissonerga-*Mosphilia*. Table 3.136 (and Figure 3.89) presents the percentage of os coxae which were assessed for pathologies. There were no pathologies observed on any of the os coxae from Kissonerga-*Mosphilia*.

Table 3.136: Percentage of os coxae which were assessed from Kissonerga-*Mosphilia*

Assessment	Count	Percent
CBA	34	43.6
No pathology	44	56.4
Totals	78	100.0

Figure 3.89: Percentage of os coxa assessed from Kissonerga-*Mosphilia*



There are a minimum of 58 discrete os coxae within the Kissonerga-*Mosphilia* sample (see footnote above). Table 3.137 provides the number of os coxae within each age group and side (including those which cannot be assessed). Table 3.138 presents the number of os coxa based on sex determination.

Table 3.137: Number of os coxae within each age group and side from Kissonerga-*Mosphilia*

Age	Count	Percent	Left	Right	Indeterminate
Subadult	49	62.8	21	14	14
Adult	19	27.9	11	10	8
Total	78	100.0	32	24	22

Table 3.138: Number of os coxae based on sex from Kissonerga-*Mosphilia*

Sex	Count Present
Male	8
Female	20

3.2.8.4 Comparison

All os coxae with acetabula which display pathology are from Souskiou-*Laona*. It does not represent a statistically significant difference of expression of pathology across the three sites (Chi Squared p=0.288). There is no difference in pathological expression based on side or on sex. All pathologies observed on the os coxae affect the hip joint in the form of degenerative joint changes with osteophytic growth at the articular surface. There is no evidence of metabolic, infectious or hematopoietic diseases, trauma, congenital pathologies or infection on any of the os coxae observed.

3.2.9 Sacrum

3.2.9.1 Souskiou-Laona

Of all the sacra examined, 71.4% are derived from Souskiou-*Laona*. Table 3.139 presents the percentage of sacra which were assessed from Souskiou-*Laona*. Those that cannot be assessed are not included within the analysis. None of the subadult sacra recovered display any pathology (Table 3.140). There are two types of pathology observed on the sacra from Souskiou-*Laona*: possible congenital defects and a possible healed infection. Table 3.141 presents the percentage of each pathology observed based on sex determination. There is no statistically significant difference in pathological expression on the sacra between the sexes (Chi Squared p=0.179).

Table 3.139: Percentage of sacra which were assessed from Souskiou-*Laona*

Assessment	**Count**	**Percent**
CBA	17	34.0
Pathology	5	10.0
No pathology	28	56.0
Totals	50	100.0

Table 3.140: Percentage of sacra with pathology by age group from Souskiou-*Laona*

Age	**Count Present**	**Count congenital defect**	**Percent**	**Count infection**	**Percent**
Subadult	2	0	0.0	0	0.0
Adult	31	4	12.9	1	3.2
Total	33	4	12.1	1	3.0

Table 3.141: Percentage of sacra with pathology by sex from Souskiou-*Laona*

Age	**Count Present**	**Count congenital defect**	**Percent**	**Count infection**	**Percent**
Male	3	2	66.7	0	0.0
Female	1	0	0.0	0	0.0
CBA	27	2	7.4	1	3.7

Four of the five observed pathologies represent a possible congenital developmental defect with either an un-fused or delayed fusion of the sacral vertebrae in an adult. The articular surfaces between the third and fourth sacral vertebrae are visible (and the first sacral vertebra is missing post-mortem) with a porous surface and raised margins on the sacrum from Skeleton A Tomb 158 (see Figure 2.14). A sacrum from Bonestack E Tomb 158 appears to display unfused second and third sacral vertebrae with porous inter-vertebral surfaces and raised margins (Figure 3.90). The second and third sacral vertebrae of the sacrum from Skeleton C Tomb 200 appear to have porous surface and are unfused (Figure 3.91). Finally, a sacrum from Bonestack B Tomb 220 appears to have an unfused first sacral vertebra. The only other pathology observed is on a sacrum from North Bonestack Tomb 165, with a possible ovoid cloaca (6.6x4.4mm) just below the spinous process of the fifth sacral vertebra at the mid-line (Figure 3.92). This cloaca is a non-active lesion and may represent a healed infection.

Figure 3.90: (Top left) Sacrum from Tomb 158 Bonestack E with a possible transitional sacral vertebra as the arrow indicates (anterior view, inferior aspect is bottom),

Figure 3.91: (Top right) Sacrum from Tomb 200 Skeleton C with possible transitional sacral vertebra as the arrow indicates (anterior view, inferior aspect is bottom).

Figure 3.92: (Left) Arrow indicates a possible healed cloaca below the spinous process of the fifth sacral vertebra at the mid-line (posterior side, inferior aspect is bottom).

3.2.9.2 Lemba-Lakkous

Of all the sacra examined, 12.9% are derived from Lemba-*Lakkous*. Table 3.142 presents the percentage of sacra which were assessed from Lemba-*Lakkous*. Table 3.143 provides the percentage of sacra within each age group and the number of each sex represented.

Table 3.142: Percentage of sacra which were assessed from Lemba-*Lakkous*

Assessment	**Count**	**Percent**
CBA	3	33.3
No pathology	6	66.7
Totals	9	100.0

Table 3.143: Percentage of sacra by age group and number of each sex from Lemba-*Lakkous*

Age Group	**Count**	**Percent**	**No. Males**	**No. Females**
Subadult	4	44.4	N/A	N/A
Adult	5	55.6	1	4

3.2.9.3 Kissonerga-Mosphilia

Of all the sacra examined, 15.7% are derived from Kissonerga-*Mosphilia*. Table 3.144 presents the sacra which were assessed. Table 3.145 provides the percentage of sacra based on age group and number of sacra by sex.

Table 3.144: Percentage of sacra which were assessed from Kissonerga-*Mosphilia*

Assessment	**Count**	**Percent**
CBA	5	45.5
No pathology	6	54.5
Totals	11	100.0

Table 3.145: Percentage of sacra by age group and number of each sex from Kissonerga-*Mosphilia*

Age Group	**Count**	**Percent**	**No. Males**	**No. Females**
Subadult	5	45.5	N/A	N/A
Adult	6	54.5	2	4

3.2.9.4 Comparison

All the sacra with pathologies are from Souskiou-*Laona*. However, there is no statistically significant difference in the expression of pathologies on the sacra across the three sites (Chi Squared p=0.622). Overall, the sacra did not preserve very well and the pathology observed is limited to possible congenital developmental defects[39]

[39] Further research into the biological affinity is required. The observation of this trait represents a possible genetic connection between three tombs at Souskiou-*Laona*, but this is tentative at best and

and a possible infection site which has healed. There is no evidence of osteoarthritic changes, metabolic disorders, infectious or hematopoietic diseases or trauma on any of the sacra observed.

3.2.10 Scapula

3.2.10.1 Souskiou-Laona

Of the total number of scapulae entries for all three sites, 70.4% are derived from Souskiou-*Laona*. Table 3.146 presents the percentage of scapulae data entries which were assessed. All pathologies observed reflect osteoarthritic changes to the shoulder joint. Table 3.147 presents the percentage of pathologies observed on the scapulae by age group. None of the subadult scapulae display evidence of pathology.

Table 3.146: Percentage of scapulae entries which were assessed from Souskiou-*Laona*

Assessment	**Count**	**Percent**
CBA	77	32.4
Pathology	7	2.9
No pathology	154	64.7
Totals	238	100.0

Table 3.147: Percentage of scapulae entries with pathology by age group from Souskiou-*Laona*

Age	**Count Present**	**Count with OA**	**Percent**
Subadult	12	0	0.0
Adult	148	7	4.7
Total	161	7	4.3

The fragmentary nature of the scapula and its identifiable parts allowed for a more accurate estimation of the minimum number of elements[40]. Table 3.148 presents the minimum number of scapulae derived from Souskiou-*Laona* and the percentage with pathology, based on side.

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cannot be overstated. It is still uncertain who was buried in the tombs at Souskiou-*Laona* and what their connections to each other may be.

[40] The minimum number of elements for the scapulae was arrived at by cross-tabulating age and side with an overlay of burial context number. When there was uncertainty based on these criteria, the data spreadsheets were consulted for a more detailed breakdown of the scapular parts recovered and the count was based on duplicate parts. Where side could not be assessed the minimum number of elements reflects the count of scapulae data entries with no side assessment.

Table 3.148: Minimum number of scapulae and percentage of scapulae with pathology by side from Souskiou-*Laona*

Side	**Count**	**Count with OA**	**Percent**
Left	56	2	3.6
Right	62	4	6.5
CBA	80	1	1.3
Total	198	7	3.5

Using the minimum number of elements, Table 3.149 provides the percentage of pathologies affecting the scapulae by sex. In most cases the scapulae with pathology did not have an associated sex assessment.

Table 3.149: Percentage of scapulae with pathology by sex from Souskiou-*Laona*

Age	**Count Present**	**Count with OA**	**Percent**
Male	11	1	9.1
Female	35	0	0.0
CBA	80	6	7.5

Due to the fragmentary state of the scapulae, each scapular part with pathology was compared with like parts to reflect a percentage of that part of the scapula with pathology. Table 3.150 presents the percentage of each part of the scapula with pathology.

Table 3.150: Percentage of each scapular part which displays pathology from Souskiou-*Laona*

Scapula Part	**Count Present**	**Count with OA**	**Percent**	**Percent of Pathology**
Glenoid	59	3	5.1	57.1
Acromion	81	4	4.9	42.9
Coracoid	47	0	0.0	0.0

The acromion process is affected in four cases: North Bonestack Tomb 165 right acromion displays a new articular facet on the inferior, lateral margin; commingled context Tomb 168 left acromion displays a 4mm ovoid facet on the superior-anterior margin; Skeleton A Tomb 158 right acromion displays a 6mm ovoid articular facet on the superior-medial aspect and Bonestack C Tomb 192 indeterminate acromion displays active porous bone growth on the anterior aspect (Figure 3.93). All four cases involve remodelled bone with either porous new bone or a new facet created on the anterior-superior aspect. The glenoid fossa is affected in three cases: Bonestack E Tomb158 right glenoid presents mild porosity and extension of the fossa towards the anterior aspect with mild osteophytic growth on the lateral margin of the fossa; commingled context Quadrant III Tomb 125 right glenoid displays a small active lesion in the fossa with some remodelling and bone growth on the superior margin above the fossa (Figure 3.94) and Bonestack Tomb 192 left glenoid displays extensive remodelling of the fossa and osteophytic growth along its margins indicating a mal-articulation (Figure 3.95). All three cases display osteophytic growth around the margin of the articular facet and porosity or remodelling of the fossa surface[41]. These osteoarthritic changes likely represent either regular wear and tear on the shoulder joint or mild osteoarthritis of the joint.

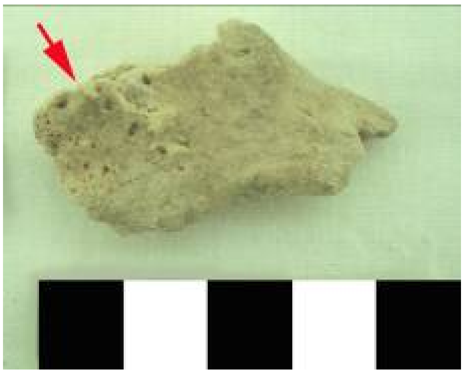


Figure 3.93: (Above left) Indeterminate acromion process from Tomb 192 Bonestack C with porous bone growth (posterior view?).

Figure 3.94: (Above right) Right glenoid fossa from Tomb 125 Quadrant I commingled with a porous lesion and osteophytic growth indicated (medial view, superior aspect to left).

Figure 3.95: (Left) Left scapula from Tomb 192 Bonestack with a remodelled glenoid fossa (lack of concavity) and osteophytic growth indicated (anterior-medial view with superior aspect to right).

3.2.10.2 Lemba-Lakkous

Of the total number of scapula entries recorded from all three sites, 10.9% are derived from Lemba-*Lakkous*. Table 3.151 presents the percentage of scapulae data entries which were assessed. All pathologies observed reflect osteoarthritic changes to the shoulder joint. Table 3.152 presents the percentage of pathologies observed on the scapulae by age group. None of the subadult scapulae display evidence of pathology.

[41] It must be noted here that for the four scapulae entries for Tombs 192 and 158, the same side scapula but different parts display pathology. This means that within those tombs, while there are two recorded affected shoulders, it could represent one scapula in each tomb. There is no way to be certain and therefore they are counted as discrete pathologies.

Table 3.151: Percentage of scapulae entries which were assessed from Lemba-*Lakkous*

Assessment	**Count**	**Percent**
CBA	7	18.9
Pathology	4	10.8
No pathology	26	70.3
Totals	37	100.0

Table 3.152: Percentage of scapulae entries with pathology by age group from Lemba-*Lakkous*

Age	**Count Present**	**Count with OA**	**Percent**
Subadult	10	0	0.0
Adult	20	4	20.0
Total	30	4	13.3

The fragmentary nature of the scapula and its identifiable parts allowed for a more accurate estimation of the minimum number of elements (see footnote above). Table 3.153 presents the minimum number of scapulae derived from Lemba-*Lakkous* and the percentage with pathology, based on side.

Table 3.153: Minimum number of scapulae and percentage of scapulae with pathology by side from Lemba-*Lakkous*

Side	**Count**	**Count with OA**	**Percent**
Left	12	2	16.7
Right	10	2	20.0
CBA	8	0	0.0
Total	30	4	13.3

Using the minimum number of elements, Table 3.154 provides the percentage of pathologies affecting the scapulae by sex. All observed cases of osteoarthritic changes to the shoulder affect male scapulae, representing two male individuals with bilateral osteoarthritic changes to the scapulae, affecting four scapulae.

Table 3.154: Percentage of scapulae with pathology by sex from Lemba-*Lakkous*

Age	**Count Present**	**Count with OA**	**Percent**
Male	5	4	80.0
Female	14	0	0.0
CBA	11	0	0.0

Due to the fragmentary state of the scapulae, each scapular part with pathology was compared with like parts to reflect a percentage of that part of the scapula with pathology. Table 3.155 presents the percentage of each part of the scapula with pathology.

Table 3.155: Percentage of each scapular part which displays pathology from Lemba-*Lakkous*

Scapula Part	**Count Present**	**Count with OA**	**Percent**	**Percent of Pathology**
Glenoid	11	4	36.3	80.0
Acromion	9	1	11.1	20.0
Coracoid	6	0	0.0	0.0

For the adult male individual from Grave 26: the right scapula displays mild osteophytic growth along the margins of the glenoid fossa (see Figure 3.31 above) and left scapula displays mild osteophytic growth along the margin of the glenoid fossa projecting laterally and bone remodelling under the coracoid (Figure 3.96). For the adult male individual from Grave 30: the right scapula displays mild osteophytic growth on the posterior margin of the glenoid fossa (Figure 3.97) and left scapula displays very mild bone growth along the posterior margin of the glenoid fossa and superior extension of the acromion with porous new bone growth (Figure 3.98).

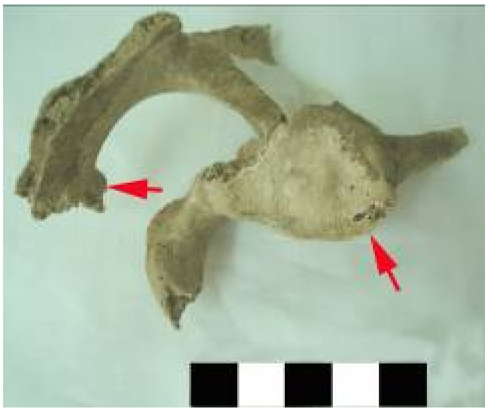


Figure 3.96: (Above left) Left scapula from Grave 26 with osteophytic growth on superior margin of the glenoid fossa indicated (anterior-medial view superior aspect to right).

Figure 3.97: (Above right) Right scapula from Grave 30 with very mild osteophytic growth on the posterior margin of the glenoid fossa and mild porosity indicated (medial view, superior aspect to left).

Figure 3.98: (Left) Left scapula from Grave 30 with mild bone growth on glenoid and acromion indicated (medial view, superior aspect to the left).

3.2.10.3 Kissonerga-Mosphilia

Of the total number of scapula entries recorded for all three sites, 18.6% are derived from Kissonerga-*Mosphilia.* Table 3.156 presents the percentage of scapulae data entries which were assessed. All pathologies observed reflect osteoarthritic changes to the shoulder joint. Table 3.157 presents the percentage of pathologies observed on the scapulae by age group. None of the subadult scapulae display evidence of pathology.

Table 3.156: Percentage of scapulae entries which were assessed from Kissonerga-*Mosphilia*

Assessment	**Count**	**Percent**
CBA	19	30.2
Pathology	1	1.6
No pathology	43	68.2
Totals	63	100.0

Table 3.157: Percentage of scapulae entries with pathology by age group from Kissonerga-*Mosphilia*

Age	**Count Present**	**Count with OA**	**Percent**
Subadult	24	0	0.0
Adult	20	1	5.0
Total	44	1	2.3

The fragmentary nature of the scapula and its identifiable parts allowed for a more accurate estimation of the minimum number of elements (see footnote above). Table 3.158 presents the minimum number of scapulae derived from Kissonerga-*Mosphilia* and the percentage with pathology, based on side.

Table 3.158: Minimum number of scapulae and percentage of scapulae with pathology by side at Kissonerga-*Mosphilia*

Side	**Count**	**Count with OA**	**Percent**
Left	19	1	5.3
Right	19	0	0.0
CBA	6	0	0.0
Total	44	1	2.3

Using the minimum number of elements, Table 3.159 provides the percentage of pathologies affecting the scapulae by sex. The observed case of osteoarthritic changes to the shoulder affects a male scapula.

Table 3.159: Percentage of scapulae with pathology by sex from Kissonerga-*Mosphilia*

Age	**Count Present**	**Count with OA**	**Percent**
Male	4	1	25.0
Female	13	0	0.0
CBA	8	0	0.0

Due to the fragmentary state of the scapulae, each scapular part with pathology was compared with like parts to reflect a percentage of that part of the scapula with pathology. Table 3.160 presents the percentage of each part of the scapula with pathology.

Table 3.160: Percentage of each scapular part which displays pathology from Kissonerga-*Mosphilia*

Scapula Part	**Count Present**	**Count with OA**	**Percent**	**Percent of Pathology**
Glenoid	14	0	0.0	0.0
Acromion	14	1	7.1	50.0
Coracoid	14	1	7.1	50.0

The acromion process is extended laterally with new bone growth and the coracoid process displays a small osteophyte on the medial aspect of the coracoid, posterior surface of the left scapula from Grave 539 (Figure 3.99).

Figure 3.99: Left acromion process from Grave 539 with mild porous extension of the lateral aspect indicated (posterior view, lateral aspect is left).

3.2.10.4 Comparison

There is a statistically significant difference amongst the three sites in regards to the expression of osteoarthritic changes to the scapulae (Chi Squared p=0.036, Cramer's V=14.0%). When examined further, there is a significant difference in pathological expression between Lemba-*Lakkous* and both sites, but not between Souskiou-*Laona* and Kissonerga-*Mosphilia*[42]. Lemba-*Lakkous* displays significantly more pathology than the other two sites, however, the four scapulae affected at Lemba-*Lakkous* represent only two discrete individuals, whereas the seven scapulae affected at Souskiou-*Laona* represent at least five discrete individuals. Males display a significantly higher prevalence of osteoarthritic changes than females to the scapula

[42] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.042, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.862 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.042.

(Chi Squared p=0.000, Cramer's V=43.2%). There is no statistically significant difference in pathological expression based on the side the scapula comes from (Chi Squared p=0.144). All these pathologies represent osteoarthritic changes which likely reflect general wear and tear on the shoulder joint or possible evidence of osteoarthritis.

3.2.11 Clavicle

3.2.11.1 Souskiou-Laona

Of all the clavicles examined, 58.9% are derived from Souskiou-*Laona*. Table 3.161 presents the percentage of clavicles assessed. All pathologies observed possibly represent osteoarthritic changes to the synovial joint with the clavicular notch of the manubrium, though the aetiology of these changes could be due to trauma or wear and tear affecting the shoulder (Thongngarm 2000). Table 3.162 presents the percentage of pathologies observed on the clavicle by age group. None of the subadult clavicles display evidence of pathology.

Table 3.161: Percentage of clavicle entries which were assessed from Souskiou-*Laona*

Assessment	**Count**	**Percent**
CBA	44	22.9
Pathology	2	1.0
No pathology	146	76.1
Totals	192	100.0

Table 3.162: Percentage of clavicle entries with pathology by age group from Souskiou-*Laona*

Age	**Count Present**	**Count with OA**	**Percent**
Subadult	8	0	0.0
Adult	140	2	1.4
Total	148	2	1.4

In order to ensure there was no double counting of the same clavicle in fragments, the minimum number of elements was tabulated and used to discuss prevalence[43]. Table 3.163 presents the minimum number of clavicles derived from Souskiou-*Laona* and

[43] The minimum number of elements was arrived a by cross-tabulating the section of the bone present with the side within each burial context and where an acromial and sternal half from the same side were recorded as two entries within the same burial context, only one clavicle was counted. This will remove the possibility of counting the same clavicle twice.

the percentage with pathology, based on side. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.155).

Table 3.163: Minimum number of clavicles and percentage of clavicles with pathology by side from Souskiou-*Laona*

Side	Count	Count with OA	Percent
Left	49	2	4.1
Right	48	0	0.0
CBA	23	0	0.0
Total	120	2	1.7

Using the minimum number of elements, Table 3.164 provides the percentage of pathologies affecting the clavicles by sex. In both cases the clavicles with pathology did not have an associated sex assessment. As both clavicles display osteoarthritic changes to the sternal portion, Table 3.165 presents the percentage of sternal portions with pathology.

Table 3.164: Percentage of clavicles with pathology by sex from Souskiou-*Laona*

Age	Count Present	Count with OA	Percent
Male	10	0	0.0
Female	23	0	0.0
CBA	87	2	2.3

Table 3.165: Percentage of the sternal portion of the clavicle with pathology from Souskiou-*Laona*

Clavicle Part	Count Present	Count with OA	Percent	Percent of Pathology
Sternal End	34	2	5.9	100.0

The sternal epiphysis of the right clavicle from Skeleton E Tomb 193 exhibits osteophytic growth towards the posterior-inferior aspect (Figure 3.100). The sternal epiphysis of the right clavicle from North Bonestack Tomb 229 is broken post-mortem, but the inferior side of the sternal end displays a small osteophyte. Post-

Figure 3.100: (Below left) Sternal epiphysis of the right clavicle from Tomb 193 Skeleton E with osteophytic growth indicated (medial view, posterior aspect is on top).

Figure 3.101: (Below right) Sternal epiphysis of a right clavicle from Tomb 229 North Bonestack with bone growth indicated (inferior side, medial aspect to the right).

mortem damage makes the extent of the osteophyte difficult to assess (Figure 3.101).

3.2.11.2 Lemba-Lakkous

Of all the clavicles examined, 15.0% are derived from Lemba-*Lakkous*. Table 3.166 presents the percentage of clavicles assessed. All pathologies observed possibly represent osteoarthritic changes. Table 3.167 presents the percentage of pathologies observed on the clavicle by age group. None of the subadult clavicles display evidence of pathology.

Table 3.166: Percentage of clavicle entries which were assessed from Lemba-*Lakkous*

Assessment	**Count**	**Percent**
CBA	4	8.2
Pathology	3	6.1
No pathology	42	85.7
Totals	49	100.0

Table 3.167: Percentage of clavicle entries with pathology by age group from Lemba-*Lakkous*

Age	**Count Present**	**Count with OA**	**Percent**
Subadult	29	0	0.0
Adult	16	3	18.8
Total	45	3	6.7

To ensure there was no double counting of the same clavicle in fragments, the minimum number of elements was tabulated and used to discuss prevalence (see above footnote). Table 3.168 presents the minimum number of clavicles derived from Lemba-*Lakkous* and the percentage with pathology, based on side. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared $p=0.556$).

Table 3.168: Minimum number of clavicles and percentage of clavicles with pathology by side from Lemba-*Lakkous*

Side	**Count**	**Count with OA**	**Percent**
Left	5	1	20.0
Right	8	2	25.0
CBA	3	0	0.0
Total	16	3	18.8

Using the minimum number of elements, Table 3.169 provides the percentage of pathologies affecting the clavicles by sex. All the clavicles with pathology are associated with males, representing two individuals. Table 3.170 presents the percentage of each half of the clavicle with pathology.

Table 3.169: Percentage of clavicles with pathology by sex from Lemba-*Lakkous*

Age	Count Present	Count with OA	Percent
Male	5	3	60.0
Female	10	0	0.0
CBA	1	0	0.0

Table 3.170: Percentage of each part of the clavicle with pathology from Lemba-*Lakkous*

Clavicle Part	Count Present	Count with OA	Percent	Percent of Pathology
Sternal End	7	1	14.3	33.3
Acromial End	8	2	25.0	66.7

The right and left clavicles from the male skeleton in Grave 30 both display porous bone growth on the acromial end of the bone, inferior aspect, possibly reflecting osteoarthritic changes to both shoulders (above Figure 3.29). The right clavicle from Grave 26 displays osteophytic growth on the sternal epiphysis which looks like a new facet has formed, possibly due to osteoarthritic changes to the shoulder or an incidence of trauma (Figure 3.102). Most of the clavicles present at Lemba-*Lakkous* are incomplete, very few have both or even one epiphyseal end. Overall, 20.0% of adult clavicles at Lemba-*Lakkous* display pathology or 14.3% of the seven sternal epiphyses and 25.0% of the eight acromial epiphyses examined.

Figure 3.102: Sternal end of a right clavicle from Grave 26 with bone growth indicated (inferior view, medial aspect to the right).

3.2.11.3 Kissonerga-Mosphilia

Of all the clavicles examined, 26.1% are derived from Kissonerga-*Mosphilia*. Table 3.171 presents the percentage of clavicles assessed. None of the clavicles from Kissonerga-*Mosphilia* display pathology. Table 3.172 presents the percentage of clavicles observed by age group.

Table 3.171: Percentage of clavicle entries which were assessed from Kissonerga-*Mosphilia*

Assessment	**Count**	**Percent**
CBA	25	29.4
Pathology	0	0.0
No pathology	60	70.6
Totals	85	100.0

Table 3.172: Percentage of clavicles by age group from Kissonerga-*Mosphilia*

Age	**Count Present**	**Percent**
Subadult	36	60.0
Adult	24	40.0
Total	60	100.0

To ensure there was no double counting of the same clavicle in fragments, the minimum number of elements was tabulated (see above footnote). Table 3.173 presents the minimum number of clavicles derived from Kissonerga-*Mosphilia* based on side.

Table 3.173: Minimum number of clavicles by side from Kissonerga-*Mosphilia*

Side	**Count**	**Percent**
Left	27	46.6
Right	27	46.6
CBA	4	6.9
Total	58	100.0

Using the minimum number of elements, Table 3.174 provides the number of clavicles by sex. Most of the clavicles observed at Kissonerga-*Mosphilia* are incomplete and very few have both or even one epiphyseal end.

Table 3.174: Number of clavicles by sex from Kissonerga-*Mosphilia*

Age	**Count Present**
Male	8
Female	13
CBA	1

3.2.11.4 Comparison

Overall, there is a statistically significant difference in pathological expression on the clavicle amongst the three sites, with Lemba-*Lakkous* displaying the highest percentage of pathology (Chi Squared p=0.015, Cramer's V =16.1%). There is no statistically significant difference in expression between Souskiou-*Laona* and

Kissonerga-*Mosphilia*[44]. Of the five clavicles with pathology across the three sites, the three with a sex assessment were male. This does represent a statistically significant difference between the sexes in regards to pathological expression on the clavicle (Chi Squared p=0.007, Cramer's V=29.6%). There is no statistically significant difference in pathological expression based on side for all three sites (Chi Squared p=0.186). The pathologies which affect both the sternal and acromial ends of the clavicles are all osteoarthritic changes with unknown aetiologies. The osteophytic growth and porosity could be caused by general degenerative changes or possibly by an incidence of trauma which is not explicitly observed. There is no evidence of infection, congenital pathologies, metabolic disorders or infectious or hematopoietic diseases or definitive trauma on any of the clavicles observed.

3.2.12 Humerus

3.2.12.1 Souskiou-Laona

Of the total sample of humeri from all three sites, 62.5% is derived from Souskiou-*Laona*. Table 3.175 presents the percentage of humeri elements which were examined. The pathologies which were observed on the humeri seem to reflect osteoarthritic changes, with one case possibly due to trauma. None of the subadult humeri observed display any evidence of pathology (Table 3.176).

Table 3.175: Percentage of humerus entries which were assessed from Souskiou-*Laona*

Assessment	Count	Percent
CBA	94	38.1
Pathology	5	2.0
No pathology	148	59.9
Totals	247	100.0

Table 3.176: Percentage of humeri elements with pathology by age group from Souskiou-*Laona*

Age	Count Present	Count with OA	Percent
Subadult	12	0	0.0
Adult	141	5	3.5
Total	153	5	3.3

[44] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.026, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.789 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.015.

In order to ensure there was no double counting of the same humerus in fragments within the same tomb, the minimum number of adult elements was tabulated and used to discuss prevalence[45]. Table 3.177 presents the minimum number of adult humeri derived from Souskiou-*Laona* and the percentage with pathology, based on side. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.698).

Table 3.177: Minimum number of humeri and percentage with pathology by side

Side	**Count**	**Count with OA**	**Percent**
Left	62	3	4.8
Right	60	2	3.3

Using the minimum number of adult elements, Table 3.178 provides the percentage of pathologies affecting the humeri by sex. The majority of humeri did not have an assessed sex and most of those with pathology also did not have an assessed sex. As all the adult humeri with pathology display osteoarthritic changes to the distal epiphysis, Table 3.179 presents the percentage of distal epiphyses with pathology.

Table 3.178: Percentage of humeri with pathology by sex from Souskiou-*Laona*

Age	**Count Present**	**Count with OA**	**Percent**
Male	14	1	7.1
Female	36	0	0.0
CBA	72	4	5.6

Table 3.179: Percentage of the distal epiphyses of the humerus with pathology from Souskiou-*Laona*

Bone Part	**Count Present**	**Count with OA**	**Percent**
Distal epiphysis	63	5	7.9

All but one of the pathological humeri display bone growth within the olecranon fossa representing a possible mal-articulation with the olecranon process of the ulna. The Bonestack in Tomb 192 contained one right and two left humeri with osteoarthritic changes to the distal epiphysis. For one left humerus, the inactive bone growth on the anterior coronoid fossa and within the olecranon fossa is so extensive it is likely caused by some form of unseen trauma which has resulted in a severe mal-articulation

[45] The minimum number of elements was arrived at by cross-tabulating the side and the portion of the bone present and examining them by tomb context. This is to avoid double counting any bones. This does not include bones for which a side could not be determined as these were typically highly fragmentary making it difficult to determine the percentage of the bone present and how many discrete elements are present.

(Figure 3.103). The right humerus from Tomb 192 displays a small lesion of remodelled bone (c.4mm) on the lateral side within the olecranon fossa (Figure 3.104) and the other left humerus from this tomb with pathology displays an extended olecranon fossa and remodelled bone on the lateral interior aspect of the olecranon fossa (Figure 3.105). The right humerus from Skeleton C Tomb 200 displays mild bone growth on the capitulum, inferior to the radial fossa which may reflect a mal-articulation with the radius (Figure 3.106). Finally, the left humerus from Bonestack A Tomb 193 displays a large septal aperature with mild bone growth on the anterior aspect, superior to the septal aperature (Figure 3.107).

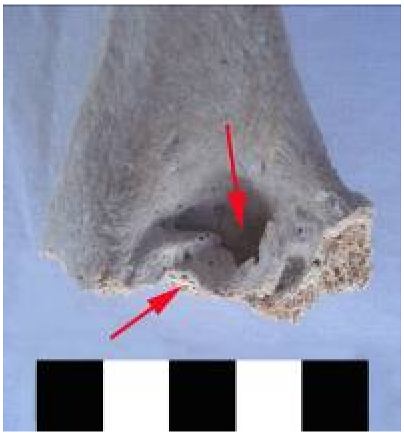


Figure 3.103: (Above left) Left humerus from Tomb 192 Bonestack with bone growth in the olecranon fossa indicated (posterior view, medial aspect to right).

Figure 3.104: (Above centre) Right humerus from Tomb 192 Bonestack with a small lesion on the lateral aspect indicated by the arrow (posterior view, medial aspect to left).

Figure 3.105: (Above right) Left humerus from Tomb 192 Bonestack with remodelled olecranon fossa (posterior view, medial aspect to right)

Figure 3.106: (Right) Right humerus from Tomb 200 Skeleton C with mild bone growth indicated (anterior view, medial aspect to left and distal side is top).

Figure 3.107: (Far Right) Left humerus from Tomb 193 Bonestack A with mild bone growth above the large septal aperture (anterior view, medial aspect to left).

3.2.12.2 Lemba-Lakkous

Of the total sample of humeri from all three sites, 16.5% is derived from Lemba-*Lakkous*. Table 3.180 presents the percentage of humeral elements which were examined. Osteoarthritic changes are the only type of pathology observed on the humeri from Lemba-*Lakkous*. None of the subadult humeri observed display any evidence of pathology (Table 3.181).

Table 3.180: Percentage of humerus entries which were assessed from Lemba-*Lakkous*

Assessment	**Count**	**Percent**
CBA	18	27.7
Pathology	1	1.5
No pathology	46	70.8
Totals	65	100.0

Table 3.181: Percentage of humeri elements with pathology by age group from Lemba-*Lakkous*

Age	**Count Present**	**Count with OA**	**Percent**
Subadult	30	0	0.0
Adult	17	1	5.9
Total	47	1	2.1

In order to ensure that there was no double counting of the same humerus in fragments within the same tomb, the minimum number of adult elements was tabulated and used to discuss prevalence (see above footnote). Table 3.182 presents the minimum number of adult humeri derived from Lemba-*Lakkous* and the percentage with pathology, based on side. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.515).

Table 3.182: Minimum number of humeri and percentage with pathology by side from Lemba-*Lakkous*

Side	**Count**	**Count with OA**	**Percent**
Left	10	0	0.0
Right	10	1	10.0

Using the minimum number of adult elements, Table 3.183 provides the percentage of pathologies affecting the humeri by sex. As all the adult humeri with pathology display osteoarthritic changes to the distal epiphysis, Table 3.184 presents the percentage of distal epiphyses with pathology.

Table 3.183: Percentage of humeri with pathology by sex from Lemba-*Lakkous*

Age	**Count Present**	**Count with OA**	**Percent**
Male	4	1	25.0
Female	12	0	0.0
CBA	4	0	0.0

Table 3.184: Percentage of the distal epiphyses of the humerus with pathology from Lemba-*Lakkous*

Bone Part	Count Present	Count with OA	Percent
Distal epiphysis	9	1	11.1

The right adult male humerus from Grave 26 displays bone remodelling and growth within the olecranon fossa, however post-mortem damage makes the extent difficult to assess. These changes possibly represent a mal-articulation with the olecranon process of the ulna (Figure 3.108).

Figure 3.108: Right humerus from Grave 26 with bone growth within the superior aspect of the olecranon fossa as indicated by the arrow (anterior view, lateral aspect to right, distal aspect is inferior).

3.2.12.3 Kissonerga-Mosphilia

Of the total sample of humeri from all three sites, 21.0% is derived from Kissonerga-*Mosphilia*. Table 3.185 presents the percentage of humeri elements which were examined. Evidence of possible trauma is the only type of pathology observed on the humeri from Kissonerga-*Mosphilia*. None of the adult humeri observed display any evidence of pathology (Table 3.186).

Table 3.185: Percentage of humerus entries which were assessed from Kissonerga-*Mosphilia*

Assessment	Count	Percent
CBA	29	34.9
Pathology	1	1.2
No pathology	53	63.9
Totals	83	100.0

Table 3.186: Percentage of humeri elements with pathology by age group from Kissonerga-*Mosphilia*

Age	Count Present	Count with pathology	Percent
Subadult	34	1	2.9
Adult	20	0	0.0
Total	54	1	1.9

In order to ensure there was no double counting of the same humerus in fragments within the same grave, the minimum number of subadult elements was tabulated and used to discuss prevalence (see above footnote). Table 3.187 presents the minimum number of subadult humeri derived from Kissonerga-*Mosphilia* and the percentage with pathology, based on side. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.308).

Table 3.187: Minimum number of subadult humeri and percentage with pathology by side from Kissonerga-*Mosphilia*

Side	Count	Count with pathology	Percent
Left	15	0	0.0
Right	12	1	8.3

The right humerus from Skeleton A Grave 563 displays 2mm of rough bone growth in the form of a small ridge on the distal third of the diaphysis which possibly reflects a minor blunt trauma (see Figure 3.57 above). Table 3.188 presents the percentage of subadult humeri with pathology of the distal third of the diaphysis.

Table 3.188: Percentage of the subadult distal epiphyses of the humerus with pathology from Kissonerga-*Mosphilia*

Bone Part	Count Present	Count with pathology	Percent
Distal third diaphysis	28	1	3.6

3.2.12.4 Comparison

There is no statistically significant difference in pathological expression on the humeri across the three sites (Chi Squared p=0.876). There are similar types of pathologies observed at Souskiou-*Laona* and Lemba-*Lakkous* with the distal epiphysis displaying bone growth reflecting osteoarthritic changes. However, at Kissonerga-*Mosphilia* a single subadult bone displays an abnormal bone growth on the diaphysis. Overall, there is no statistically significant difference in pathological expression based on side, sex or age group (Chi Squared p=0.261, p=0.323 and p=0.127 respectively). With regard to pathologies observed, of the seven humeri which display pathology, six are adults who display osteoarthritic changes to the distal epiphysis, one of which may represent a possible incidence of trauma. There is no evidence of infection, metabolic disorders, infectious or hematopoietic diseases or congenital defects. While there is some possible evidence of trauma, there is no indication of fracture on any of the humeri.

3.2.13 Radius

3.2.13.1 Souskiou-Laona

Of the total sample of radii examined, 64.4% are derived from Souskiou-*Laona*. Table 3.189 presents the percentage of radial elements which were examined. Trauma and osteoarthritic changes appear to be the only pathologies observed on the radii. None of the subadult radii observed display any evidence of pathology (Table 3.190).

Table 3.189: Percentage of radii elements which were assessed from Souskiou-*Laona*

Assessment	**Count**	**Percent**
CBA	44	19.0
Pathology	12	5.2
No pathology	176	75.8
Totals	232	100.0

Table 3.190: Percentage of radii elements with pathology by age group from Souskiou-*Laona*

Age	**Count Present**	**Count with OA**	**Percent**	**Count with Trauma**	**Percent**
Subadult	24	0	0.0	0	0.0
Adult	164	10	6.1	2	1.2
Total	188	10	5.3	2	1.1

In order to ensure that there was no double counting of the same radius from fragments within the same tomb, the minimum number of adult elements was tabulated and used to discuss prevalence[46]. Table 3.191 presents the minimum number of adult radii derived from Souskiou-*Laona* and the percentage with pathology, based on side. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.321). One un-sided radius displays evidence of osteoarthritic changes.

Table 3.191: Minimum number of radii and percentage with pathology by side from Souskiou-*Laona*

Side	Count	Count with OA	Percent	Count with trauma	Percent
Left	52	5	9.6	0	0.0
Right	50	4	8.0	2	4.0

[46] The minimum number of elements was arrived at by cross-tabulating the side and the portion of the bone present and examining them by tomb context. This is to avoid double counting any bones. This does not include bones for which a side could not be determined as these were typically highly fragmentary making it difficult to determine the percentage of the bone present and how many discrete elements are present.

Using the minimum number of adult elements, Table 3.192 provides the percentage of pathologies affecting the radii by sex. Almost half of the radii with pathology were female or possibly female. This does not represent a statistically significant difference in pathological expression of the radius based on sex determination (Chi Squared p=0.664).

Table 3.192: Percentage of radii with pathology by sex from Souskiou-*Laona*

Age	**Count Present**	**Count with OA**	**Percent**	**Count with trauma**	**Percent**
Male	13	1	7.7	0	0.0
Female	34	3	8.8	2	5.9
CBA	55	4	7.3	0	0.0

The osteoarthritic changes observed on the adult radii typically affect the proximal epiphysis and/or proximal third of the diaphysis (predominately the radial tuberosity). Table 3.193 presents the percentage of the different parts of the radius with osteoarthritic change.

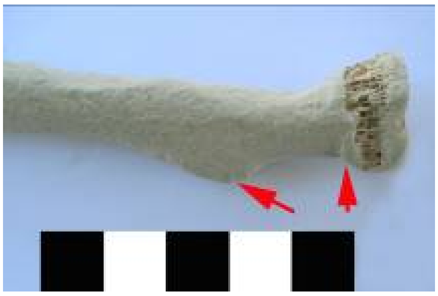
Table 3.193: Percentage of the parts of the radius with osteoarthritic changes from Souskiou-*Laona*

Bone Part	**Count Present**	**Count with OA**	**Percent**
Proximal epiphysis	73	9	12.3
Proximal third of diaphysis	125	10	8.0
Distal epiphysis	45	1	2.2

Both observations of trauma on the Souskiou-*Laona* radii affect the right radii of females. The right radius of Skeleton D Tomb 200 displays a healed fracture of the distal end of the diaphysis, evidenced by a thickening of the distal end and twisting towards the anterior aspect with bone growth around the distal end and shortening of the whole bone (see Figure 3.14 above – if osteoporotic, possibly a Colles fracture). The right radius of Skeleton A Tomb 201 presents a healed fracture in the middle-third of the diaphysis, evidenced by a bony callous caused by a mal-fusion which had become infected and resulted in a cloaca (see Figure 3.15 above).

The ten radii with osteoarthritic changes at Souskiou-*Laona* are most often affected in proximal half of the bone. The radial head displays osteoarthritic changes in nine cases, along with other parts of the radius in many cases. A right radius from

Bonestack D Tomb 220 displays remodelling of the radial head, appearing compressed on the lateral surface. A left radius of Skeleton A Tomb 192 displays a thin ridge (>2mm) of bone growth on the distal aspect of the radial head. A second left radius from the Skeleton A Tomb 192 context displays bone growth along the posterior margin of the radial tuberosity and osteophytes projecting distally from the inferior aspect of the radial head on the posterior surface (Figure 3.109). A radial head of the left radius from the Bonestack in Tomb 200 is angled laterally with mild bone growth along the lateral-proximal margin of the superior facet (Figure 3.110). A left radius from the Bonestack Tomb 160 displays mild osteophytic growth on the mesial-anterior aspect of the radial head and along the posterior margin of the radial tuberosity. The right radius of the North Skeleton Tomb 108 displays 1-2mm osteophytes projecting inferiorly from the radial head and extension of the proximal aspect of the radial head with flattening of the surface and a backwards 'S' shaped facet created on the articular surface caused by mal-articulation with the distal epiphysis of the humerus (Figure 3.111). An un-sided radius from Bonestack E Tomb 158 displays mild osteophytic growth on the proximal aspect of the radial head and flattening of the proximal articular facet of the radial head with an 'S' shaped facet created, along with some porosity and accentuated angle of the head with woven bone on the neck (Figure 3.112). A left radius from the Bonestack Tomb 228 displays a small (2mm) non-active lesion on the proximal surface of the radial head as well as osteophytic growth on the posterior margin of the radial tuberosity (Figure 3.113). A right radius from Bonestack A Tomb 220 displays mild osteophytic growth along the posterior margin of the radial tuberosity and mild osteophytic growth on the anterior margin of the distal epiphysis (Figure 3.114). The right radius from Skeleton C Tomb 200 displays very mild osteophytic growth along the posterior aspect of the radial tuberosity.



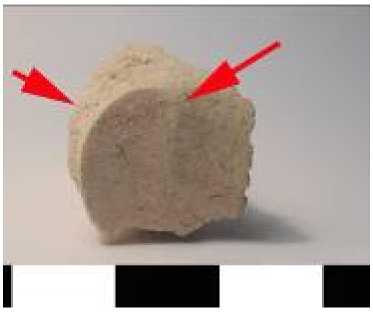


Figure 3.109: (Above left) Left radius from Tomb 192 Skeleton A with mild osteophytic growth on the posterior margin of the radial tuberosity and the posterior aspect of the radial head, as indicated (anterior-medial view, proximal aspect to right).

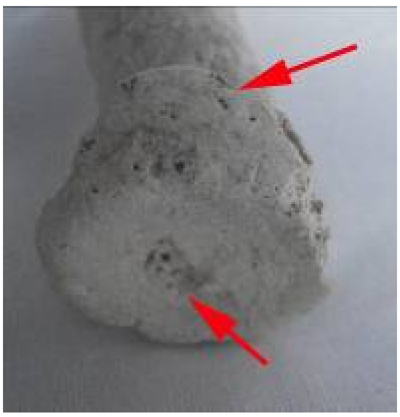
Figure 3.110: (Above centre) Left radius from Tomb 200 Bonestack with a lateral angle to the head and mild bone growth along the lateral-proximal margin of the head, as indicated (posterior view, proximal epiphysis on top).

Figure 3.111: (Above right) Right radius from Tomb 108 North Skeleton with remodelled S-shape on the proximal aspect of the head and bone growth, as indicated (proximal view, medial aspect is on top).

Figure 3.112: (Below left) Unsided radius from Tomb 158 Bonestack E displays mild osteophytic growth and a flattened, remodelled proximal epiphysis as indicated (lateral view, proximal epiphysis on bottom).

Figure 3.113: (Below right) Close up detail of the lesion and bone growth on the proximal epiphysis of the left radius from Tomb 228 Bonestack (proximal view, medial aspect is on top).

Figure 3.114: (Right) Right radius from Tomb 220 Bonestack A with mild bone growth on the posterior aspect of the radial tuberosity and distal epiphysis as indicated, (anterior view, proximal aspect is on top).



Where the radial tuberosity displays osteophytic growth along its posterior margin it possibly reflects a non-pathological change to the muscle insertion point of the *biceps brachii* (Debono *et al.* 2004; Robb 1998; Weiss and Jurmain 2007; Wilczak 1998). It was most likely asymptomatic. The adult radii of Souskiou-*Laona* display osteoarthritic changes to the articular surface and trauma in the form of healed fractures, and in one case, infection. There is no evidence of congenital defects or metabolic disorder or infectious or hematopoietic disease.

3.2.13.2 Lemba-Lakkous

Of the total sample of radii elements, 14.2% are derived from Lemba-*Lakkous*. Table 3.194 presents the percentage of radial elements which were examined. Possible osteoarthritic changes appear to be the only type of pathology observed on the radii derived from Lemba-*Lakkous*. None of the subadult radii observed display any evidence of pathology (Table 3.195).

Table 3.194: Percentage of radius elements which were assessed from Lemba-*Lakkous*

Assessment	**Count**	**Percent**
CBA	14	27.5
Pathology	3	5.9
No pathology	34	66.7
Totals	51	100.0

Table 3.195: Percentage of radii elements with pathology by age group from Lemba-*Lakkous*

Age	**Count Present**	**Count with OA**	**Percent**
Subadult	23	0	0.0
Adult	14	3	21.4
Total	37	3	8.1

In order to ensure there was no double counting of the same radius from fragments within the same tomb, the minimum number of adult elements was tabulated and used to discuss prevalence (see above footnote). Table 3.196 presents the minimum number of adult radii derived from Lemba-*Lakkous* and the percentage with pathology, based on side. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.595).

Table 3.196: Minimum number of radii and percentage with pathology by side from Lemba-*Lakkous*

Side	**Count**	**Count with OA**	**Percent**
Left	6	2	33.3
Right	5	1	20.0

Using the minimum number of adult elements, Table 3.197 provides the percentage of pathologies affecting the radii by sex. Both male radii belong to the same individual from Grave 26. This does not represent a statistically significant difference in pathological expression of the radius based on sex determination (Chi Squared $p=0.160$).

Table 3.197: Percentage of radii with pathology by sex from Lemba-*Lakkous*

Age	**Count Present**	**Count with OA**	**Percent**
Male	4	2	50.0
Female	9	1	11.1
CBA	1	0	0.0

All three radii display the same lesion in the form of osteophytic growth along the posterior margin of the radial tuberosity. Table 3.198 presents the percentage of the proximal third of the diaphysis of the radius with pathology.

Table 3.198: Percentage of the parts of the radius with osteoarthritic changes from Lemba-*Lakkous*

Bone Part	**Count Present**	**Count with OA**	**Percent**
Proximal third of diaphysis	14	3	21.4

The left and right radii from Grave 26 and the left radius from Grave 25 all display mild osteophytic growth along the posterior margin of the radial tuberosity (Figure 3.115). This lesion is either caused by osteoarthritic changes to the elbow joint or possibly a non-pathological change to the muscle insertion point of the *biceps brachii*. It was most likely asymptomatic. There is no evidence of trauma, infection, metabolic disorders or infectious or hematopoietic disease or congenital defects on any of the radii at Lemba-*Lakkous*.

Figure 3.115: Left radius from Grave 26 with bone growth along the posterior margin of the radial tuberosity and remodelling of the tuberosity as indicated, (medial view, proximal aspect is right).

3.2.13.3 Kissonerga-Mosphilia

Of the total sample of radii elements examined, 21.4% are derived from Kissonerga-*Mosphilia*. Table 3.199 presents the percentage of radial elements which were examined. A possible evidence of a disease or disorder appears to be the only pathology observed on the radii from Kissonerga-*Mosphilia*. None of the adult radii observed display any evidence of pathology (Table 3.200).

Table 3.199: Percentage of radius elements which were assessed from Kissonerga-*Mosphilia*

Assessment	**Count**	**Percent**
CBA	20	26.0
Pathology	1	1.3
No pathology	56	72.7
Totals	77	100.0

Table 3.200: Percentage of radii elements with pathology by age group from Kissonerga-*Mosphilia*

Age	**Count Present**	**Count with pathology**	**Percent**
Subadult	39	1	2.6
Adult	18	0	0.0
Total	57	1	1.8

In order to ensure there was no double counting of the same radius in fragments within the same tomb, the minimum number of subadult elements was tabulated and used to discuss prevalence (see above footnote). Table 3.201 presents the minimum number of subadult radii derived from Kissonerga-*Mosphilia* and the percentage with pathology, based on side. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.415).

Table 3.201: Minimum number of radii and percentage with pathology by side from Kissonerga-*Mosphilia*

Side	**Count**	**Count with pathology**	**Percent**
Left	20	0	0.0
Right	15	1	6.7

The right radius from Grave 567 appears to bow laterally at the middle of the diaphysis, possibly indicating a metabolic disorder, infectious or hematopoietic disease or vitamin or mineral deficiency (see Figure 3.56 above). There is no evidence of osteoarthritic changes, congenital defects, trauma or infection on any of the radii at Kissonerga-*Mosphilia*.

3.2.13.4 Comparison

There is no statistically significant difference in pathological expression on the radii across all three sites (Chi Squared p=0.312). However, there are some interesting differences in the type of pathological expression across the three sites. First of all, the only radius to display any pathology at Kissonerga-*Mosphilia* is a subadult which most likely indicates a metabolic disorder or infectious or hematopoietic disease, while only adult radii display pathology at the other two sites. Second, the only trauma, in the form of fractures, observed occurs at Souskiou-*Laona*. Third, osteoarthritic changes or bone growth at the muscle insertion point of the posterior margin of the radial tuberosity is the only pathology which was observed at Lemba-*Lakkous* with a few cases at Souskiou-*Laona* as well. This osseous change to the bone affects only fully fused, adult, bones and may reflect heavy use of the *biceps brachii* which is a flexor and rotating muscle for the forearm. Osteoarthritic changes to the proximal surface of the radial head are exclusively observed at Souskiou-*Laona*, reflecting a mal-articulation with the humerus and possibly causing some stiffness in the movement of the elbow. There is no significant difference of any of the pathologies based on the side which the bone comes from or the assessed sex of the individual (Chi Squared p=0.140 and p=0.510). None of the radii display evidence of congenital defects.

3.2.14 Ulna

3.2.14.1 Souskiou-Laona

Of the total sample of ulnar elements examined, 68.1% are derived from Souskiou-*Laona*. Table 3.202 presents the percentage of ulnae which were examined. Osteoarthritic changes are the only pathology type observed on the ulnae at Souskiou-*Laona*. None of the subadult ulnae observed display any evidence of pathology (Table 3.203).

Table 3.202: Percentage of ulnar elements which were assessed from Souskiou-*Laona*

Assessment	Count	Percent
CBA	66	28.3
Pathology	6	2.6
No pathology	161	69.1
Totals	233	100.0

Table 3.203: Percentage of ulnar elements with pathology by age group from Souskiou-*Laona*

Age	Count Present	Count with OA	Percent
Subadult	14	0	0.0
Adult	153	6	3.9
Total	167	6	3.6

In order to ensure there was no double counting of the same ulna in fragments within the same tomb, the minimum number of adult elements was tabulated and used to discuss prevalence[47]. Table 3.204 presents the minimum number of adult ulnae derived from Souskiou-*Laona* and the percentage with pathology, based on side. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.342).

Table 3.204: Minimum number of ulnae and percentage with pathology by side from Souskiou-*Laona*

Side	Count	Count with OA	Percent
Left	59	4	6.8
Right	53	2	3.8

Using the minimum number of adult elements, Table 3.205 provides the percentage of pathologies affecting the ulnae by sex. Only ulnae assessed as female or with no sex assessment possible display pathology. There is no statistically significant difference in pathological expression of the ulna based on sex determination (Chi Squared p=0.286).

Table 3.205: Percentage of ulnae with pathology by sex from Souskiou-*Laona*

Age	Count	Count with OA	Percent
Male	12	0	0.0
Female	34	3	8.8
CBA	66	3	4.5

[47] The minimum number of elements was arrived at by cross-tabulating the side and the portion of the bone present and examining them by tomb context. This is to avoid double counting any bones. This does not include bones for which a side could not be determined as these were typically highly fragmentary making it difficult to determine the percentage of the bone present and how many discrete elements are present.

All the osteoarthritic changes observed on the adult ulnae affect the proximal end of the bone. Table 3.206 presents the percentage of the proximal thirds of the ulnae with osteoarthritic change.

Table 3.206: Percentage of the proximal third of the ulna with osteoarthritic changes from Souskiou-*Laona*

Bone Part	Count Present	Count with OA	Percent
Proximal third of diaphysis	141	6	4.3

All six ulnae with pathology involve the extension of the radial notch distally and posteriorly. The left ulnae from Skeleton South Tomb 108, Bonestack Tomb 228 and Skeleton A Tomb 220 and the right ulna from Bonestack Tomb 192 display mild extension of the radial notch with some bone growth (c.2-4mm) (Figure 3.116). The right ulna from Skeleton A Tomb 192 displays similar extension of the radial notch as well as bone growth inferior to the radial notch. The left ulna from Bonestack Tomb 192 also exhibits the extension of the radial notch as well as osteophytic growth at the margins of and porosity of the olecranon process and lunar notch. Post-mortem damage and fragmentation makes the extent of the pathology difficult to assess (Figure 3.117). These osteoarthritic changes of the articular facets at the elbow would have possibly caused some stiffness of the joint. There is no evidence of trauma, infection, metabolic disorders or infectious or hematopoietic disease or congenital defects on any of the ulnae at Souskiou-*Laona*.

Figure 3.116: (Left) Left ulna from Tomb 220 Skeleton A with mild extension of the radial notch distally as indicated by the arrow (lateral view, proximal aspect is top).

Figure 3.117: (Right) Olecranon process of a left ulna from Tomb 192 Bonestack displays osteophytic growth of the proximal margins of the articular surface as indicated by the arrows (anterior-lateral view, proximal aspect to the top).

3.2.14.2 Lemba-Lakkous

Of the total sample of ulnae examined, 13.2% are derived from Lemba-*Lakkous*. Table 3.207 presents the percentage of ulnar elements which were examined. None of the ulnae at Lemba-*Lakkous* display any pathology. Table 3.208 provides the percentage of ulnae from each age group.

Table 3.207: Percentage of ulnar elements which were assessed from Lemba-*Lakkous*

Assessment	**Count**	**Percent**
CBA	17	37.8
Pathology	0	0.0
No pathology	28	62.2
Totals	45	100.0

Table 3.208: Percentage of ulnar elements by age group from Lemba-*Lakkous*

Age	**Count**	**Percent**
Subadult	18	64.3
Adult	10	35.7
Total	28	100.0

In regards to preservation of the ulnae at Lemba-*Lakkous*, only eight proximal epiphyses and one distal epiphysis have survived intact. While several of the forming diaphyses of the subadult ulnae are relatively complete, very few include the epiphyseal ends. There is no evidence of osteoarthritic changes, trauma, infection, metabolic disorders or infectious or hematopoietic disease or congenital defects on any of the ulnae at Lemba-*Lakkous*.

3.2.14.3 Kissonerga-Mosphilia

Of the total sample of ulnar elements examined, 18.7% are derived from Kissonerga-*Mosphilia*. Table 3.209 presents the percentage of ulnae which were examined. Osteoarthritic changes are the only type of pathology observed on the ulnae at Kissonerga-*Mosphilia*. None of the subadult ulnae observed display any evidence of pathology (Table 3.210).

Table 3.209: Percentage of ulnar elements which were assessed from Kissonerga-*Mosphilia*

Assessment	**Count**	**Percent**
CBA	21	32.8
Pathology	1	1.6
No pathology	42	65.6
Totals	64	100.0

Table 3.210: Percentage of ulnar elements with pathology by age group from Kissonerga-*Mosphilia*

Age	**Count Present**	**Count with OA**	**Percent**
Subadult	27	0	0.0
Adult	16	1	6.3
Total	43	1	2.3

In order to ensure there was no double counting of the same ulna in fragments within the same tomb, the minimum number of adult elements was tabulated and used to discuss prevalence (see above footnote 35). Table 3.211 presents the minimum number of adult ulnae derived from Kissonerga-*Mosphilia* and the percentage with pathology, based on side. There is no statistically significant difference in pathological expression based on side (Chi Squared p=0.257).

Table 3.211: Minimum number of ulnae and percentage with pathology by side from Kissonerga-*Mosphilia*

Side	**Count**	**Count with OA**	**Percent**
Left	8	0	0.0
Right	5	1	20.0

Using the minimum number of adult elements, Table 3.212 provides the percentage of pathologies affecting the ulnae by sex. Once again the only ulna with pathology is associated with a female individual. This does not represent a statistically significant difference in pathological expression of the ulna based on sex determination (Chi Squared p=0.512).

Table 3.212: Percentage of ulnae with pathology by sex from Kissonerga-*Mosphilia*

Age	**Count**	**Count with OA**	**Percent**
Male	4	0	0.0
Female	9	1	11.1
CBA	1	0	0.0

All the osteoarthritic change observed on the adult ulna affects the distal epiphysis of the bone. Table 3.213 presents the percentage of the distal epiphyses of the ulnae with osteoarthritic change.

Table 3.213: Percentage of the distal epiphyses of the ulna with osteoarthritic changes from Kissonerga-*Mosphilia*

Bone Part	**Count Present**	**Count with OA**	**Percent**
Distal epiphyses	4	1	25.0

Skeleton B Grave 505 displays mild proximally directed osteophytic growth along the anterior margin of the distal epiphysis in the form of a low ridge (see Figure 3.48 above). There is no evidence of trauma, infection, metabolic disorders or infectious or hematopoietic disease or congenital defects on any of the ulnae at Kissonerga-*Mosphilia*.

3.2.14.4 Comparison

There is no statistically significant difference in pathological expression on the ulnae across the three sites (Chi Squared p=0.512). Overall, there is low occurrence of pathology on the ulnae across the three sites which may be due in part to the relatively low levels of survival of the epiphyses, particularly at Lemba-*Lakkous*. There is no statistically significant difference in pathological expression across the three sites based on the side of the bone or assessed sex (Chi Squared p=0.356 and p=0.510). Osteoarthritic changes were observed exclusively to the proximal articular facets of the ulna at Souskiou-*Laona*, while only the distal epiphysis was affected at Kissonerga-*Mosphilia*. There is no evidence of trauma, infection, metabolic disorders or infectious or hematopoietic disease or congenital defects on any of the ulnae.

3.2.15 Carpals

3.2.15.1 Souskiou-Laona

Of the total carpal series examined from all three sites, 72.7% is derived from Souskiou-*Laona*. All the pathologies observed on the carpals at Souskiou-*Laona* reflect osteoarthritic changes to various articular surfaces. None of the subadult carpals examined display evidence of pathology (Table 3.214).

Table 3.214: Percentage of carpals with pathology by age group from Souskiou-*Laona*

Age	**Count**	**Count with OA**	**Percent**	**CBA for pathology**	**Percent**
Subadult	5	0	0.0	1	20.0
Adult	267	13	4.9	24	9.0
Total	272	13	4.8	25	9.2

Table 3.215 presents the percentage of pathology observed on each adult carpal derived from Souskiou-*Laona*[48]. The pisiforms, triquetrals and trapezoids do not display any evidence of pathology.

Table 3.215: Number of each carpal and percentage with osteoarthritic changes from Souskiou-*Laona*

Carpal			**Indeterminate**	**Left**	**Right**	**Total**
Scaphoid	No pathology	Count	2	19	18	39
	OA observed	Count	0	1	2	3
	Total	Count	2	20	20	42
	Percent with OA		0.0	5.0	10.0	7.1
Lunate	No pathology	Count	1	19	21	41
	OA observed	Count	0	1	1	2
	Total	Count	1	20	22	43
	Percent with OA		0.0	5.0	4.5	4.7
Triquetral	No pathology	Count	1	5	6	12
	OA observed	Count	0	0	0	0
	Total	Count	1	5	6	12
Hamate	No pathology	Count	1	19	17	37
	OA observed	Count	0	3	1	4
	Total	Count	1	22	18	41
	Percent with OA		0.0	13.6	5.6	9.8
Capitate	No pathology	Count	1	11	17	29
	OA observed	Count	0	3	0	3
	Total	Count	1	14	17	32
	Percent with OA		0.0	21.4	0.0	9.4
Trapezoid	No pathology	Count	0	7	12	19
	OA observed	Count	0	0	0	0
	Total	Count	0	7	12	19
Trapezium	No pathology	Count	1	22	10	33
	OA observed	Count	0	1	0	1
	Total	Count	1	23	10	34
	Percent with OA		0.0	4.3	0.0	2.9
Pisiform	No pathology	Count	1	9	8	18
	OA observed	Count	0	0	0	0
	Total	Count	1	9	8	18
Indet carpal	No pathology	Count	2	0	0	2
	OA observed	Count	0	0	0	0
	Total	Count	2	0	0	2

There are a minimum of 23 discrete adult skeletons represented within the carpal sample based on the left trapezium. There is no statistically significant difference in pathological expression on the carpals based on side (Chi Squared p=0.209). Only two discrete skeletons, Skeleton A Tomb 192 and Skeleton E Tomb 165, display

[48] Note that this does not include the five subadult carpals identified nor the 25 carpals which could not be assessed for pathology.

osteoarthritic changes to the carpals. The rest of the pathological carpals are from commingled contexts, so it is difficult to discuss differential expression between the sexes. The two discrete articulated skeletons which display pathology on the carpals are both female. In general, the hamate displays the highest frequency of pathological expression of all the carpals, while the left capitate displays the highest frequency of pathology for which side is also accounted.

Each carpal displays osteoarthritic changes to an articular surface in the form of remodelling or osteophytic growth. Right scaphoids from commingled Tomb 132 and Bonestack B Tomb 220, both display osteophytic growth on the captitate articular surface. A left scaphoid from Skeleton A Tomb 192 is remodeled on the dorsal articular surface, that affected the articulation with the radius. Three left hamates, derived from Skeleton E Tomb 165, Bonestack Tomb 192, Bonestack Tomb 200, display osteoarthritic changes in the form of a remodeled general morphology, osteophytic growth on the articular facets with the fourth and fifth metacarpals and porosity on the capitate articular surface, respectively. The hamulus of a right hamate from Bonestack C Tomb 220 is rough and appears compressed (Figure 3.118). The left lunate from Skeleton A Tomb 192 displays remodeling which has created two new facets on the triquetral and radial articulations. The right lunate from the same context displays a small osteophyte on the dorsal aspect. The capitate articulates with the base of the third metacarpal most directly at its distal end and with the scaphoid and lunate at the proximal end and it is the base which displays osteophytic growth in two of the cases, affecting the articulation with the third metacarpal. Three left capitates derived from: Skeleton A Tomb 192 with a remodeled lateral articular surface, Skeleton E Tomb 165 with a remodeled third metacarpal articular surface and commingled Tomb 192 with an osteophyte from the third metacarpal articular surface, display osteoarthritic changes. Finally, a left trapezium from Skeleton A Tomb 192 displays remodeling on the palmar aspect with the crest missing (see Figures 3.119 and 3.120 for examples of carpal pathology).

Figure 3.118: (Below left) The hamulus of a right hamate from Tomb 220 Bonestack C appears remodelled, as indicated (view from the triquetral, palmar is up).

Figure 3.119: (Below centre) The left capitate (left – lateral view from scaphoid and trapezoid proximal is up) remodelled third metacarpal articular surface and left hamate (right – palmar view, hamulus is up) which is remodelled from Tomb 165 Skeleton E.

Figure 3.120: (Below right) (Clockwise from top left) Left trapezium (medial view) with remodelled crest; left capitate (lateral view) with remodelled articular surface and bone growth; left scaphoid (view from capitate) dorsal side is remodelled; left lunate (view from the triquetral, palmar is up) with remodelling on dorsal aspect from Tomb 192 Skeleton A.

3.2.15.2 Lemba-Lakkous

Of the total carpal sample examined from all three sites, 6.1% are derived from Lemba-*Lakkous*. All the pathologies observed on the carpals from Lemba-*Lakkous* reflect osteoarthritic changes to various articular surfaces. None of the subadult carpals examined display evidence of pathology (Table 3.216).

Table 3.216: Percentage of carpals with pathology by age group from Lemba-*Lakkous*

Age	**Count**	**Count with OA**	**Percent**	**CBA for pathology**	**Percent**
Subadult	1	0	0.0	0	0.0
Adult	22	2	9.1	1	4.5
Total	23	2	8.7	1	4.3

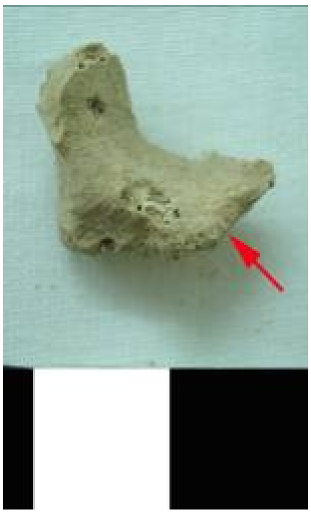
Table 3.217 presents the percentage of pathology observed on each adult carpal type derived from Lemba-*Lakkous*[49]. There were no pisiforms or triquetrals recovered. No pathologies were observed on any scaphoids, lunates, hamates or trapezia.

[49] Note that this does not include the single subadult carpal identified nor the single carpal which could not be assessed for pathology.

Table 3.217: Number of each carpal and percentage with osteoarthritic changes from Lemba-*Lakkous*

Carpal			**Indeterminate**	**Left**	**Right**	**Total**
Scaphoid	No pathology	Count	1	2	2	5
	OA observed	Count	0	0	0	0
	Total	Count	1	2	2	5
Lunate	No pathology	Count	0	3	2	5
	OA observed	Count	0	0	0	0
	Total	Count	0	3	2	5
Hamate	No pathology	Count	0	2	3	5
	OA observed	Count	0	0	0	0
	Total	Count	0	2	3	5
Capitate	No pathology	Count	0	0	0	0
	OA observed	Count	0	0	1	1
	Total	Count	0	0	1	1
	Percent with OA		0.0	0.0	100.0	100.0
Trapezoid	No pathology	Count	0	1	1	2
	OA observed	Count	0	0	1	1
	Total	Count	0	1	2	3
	Percent with OA		0.0	0.0	50.0	33.3.
Trapezium	No pathology	Count	0	1	1	2
	OA observed	Count	0	0	0	0
	Total	Count	0	1	1	2

Figure 3.121: Right trapezoid from Grave 25 with bone growth at the capitate-scaphoid boundary (proximal view, palmar is up)



There are a minimum of three discrete adult skeletons represented within the carpal sample based on the left lunate and right hamate. There is no statistically significant difference in pathological expression on the carpals based on side (Chi Squared p=0.333). The two discrete articulated skeletons which display pathology on the carpals are both female. Due to the very small sample size, the right capitate displays the highest prevalence of osteoarthritic changes of all the carpals at Lemba-*Lakkous*. The sole capitate recovered from Grave 35 from Lemba-*Lakkous* is from the right side and displays an extension of the third metacarpal articular facet towards the medial posterior aspect with osteophytic growth (see Figure 3.30 above). A right trapezoid from Grave 25 displays extension of the dorsal capitate-scaphoid boundary with osteophytic growth (Figure 3.121).

3.2.15.3 Kissonerga-Mosphilia

Of the total carpal sample examined from all three sites, 21.1% is derived from Kissonerga-*Mosphilia*. The only pathology observed on the carpals from Kissonerga-*Mosphilia* reflects a possible osteoarthritic change. None of the subadult carpals examined display evidence of pathology (Table 3.218).

Table 3.218: Percentage of carpals with pathology by age group from Kissonerga-*Mosphilia*

Age	Count	Count with OA	Percent	CBA for pathology	Percent
Subadult	33	0	0.0	1	3.0
Adult	46	1	2.2	3	6.5
Total	79	1	1.3	4	5.1

Table 3.219 presents the percentage of pathology observed on each adult carpal type derived from Kissonerga-*Mosphilia*[50]. The lunates, hamates, capitates, scaphoids, pisiforms, triquetrals and trapezia do not display any evidence of pathology.

Table 3.219: Number of each carpal and percentage with osteoarthritic changes from Kissonerga-*Mosphilia*

Carpal			Indeterminate	Left	Right	Total
Scaphoid	No pathology	Count	0	3	3	6
	OA observed	Count	0	0	0	0
	Total	Count	0	3	3	6
Lunate	No pathology	Count	1	6	2	9
	OA observed	Count	0	0	0	0
	Total	Count	1	6	2	9
Triquetral	No pathology	Count	0	0	2	2
	OA observed	Count	0	0	0	0
	Total	Count	0	0	2	2
Hamate	No pathology	Count	0	4	1	5
	OA observed	Count	0	0	0	0
	Total	Count	0	4	1	5
Capitate	No pathology	Count	0	5	3	8
	OA observed	Count	0	0	0	0
	Total	Count	0	5	3	8
Trapezoid	No pathology	Count	0	3	3	6
	OA observed	Count	0	1	0	1
	Total	Count	0	4	3	7
	Percent of OA		0.0	25.0	0.0	14.3
Carpal			**Indeterminate**	**Left**	**Right**	**Total**

[50] Note that this does not include the 33 subadult carpals identified nor the three adult carpals which could not be assessed for pathology.

Trapezium	No pathology	Count	0	2	3	5
	OA observed	Count	0	0	0	0
	Total	Count	0	2	3	5
Pisiform	No pathology	Count	0	0	1	1
	OA observed	Count	0	0	0	0
	Total	Count	0	0	1	1

Figure 3.122: Left trapezoid with remodelled morphology of the proximal side (view from the capitate-scaphoid boundary, palmar is up).

There are a minimum of six discrete adult skeletons represented within the carpal sample based on the left lunate. There is no statistically significant difference in pathological expression on the carpals based on side (Chi Squared p=0.626). The only carpal which displays pathology is female. The left trapezoid, from Grave 526 appears to have an altered morphology as the proximal aspect is flattened (Figure 3.122).

3.2.15.4 Comparison

There is no statistically significant difference in pathological expression on the carpals across the three sites when all the carpals are included (Chi Squared p=0.222). Overall, the osteoarthritic changes affecting the carpals at all three sites are rather minor and it is uncertain how much of an impact on the individuals these pathological variations would have had on the use of the wrist. The changes most commonly occur as changes to the morphology of the carpal affecting an articular surface or osteophytic growth on the margins or processes of the bones. The limited recovery of carpals from all sites, in particular at Lemba-*Lakkous*, brings into question the survival rate of the different carpal bones. The lunate and scaphoid are the most frequently identified carpals overall. There are several issues which complicate survival rates of the different carpals: resistance of the bone to taphonomic damage which will affect not only the survival of the bone but the ability of the observer to identify it, the appearance of the bone to the untrained excavator may limit recovery and the general morphology of the bone. Burial practice and secondary manipulation can also impact the survival rate of the bones within the grave.

While the only carpals with pathology are associated with females, there is no statistically significant difference in pathological expression across the three sites based on side or sex (Chi Squared p=0.372 and p=0.092). Table 3.220 provides the results of the significance tests amongst all three sites regarding the pathological expression of each carpal. Souskiou-*Laona* has a statistically significant greater prevalence of pathology on the capitate. Lemba-*Lakkous* displays a significantly higher prevalence of pathology on the trapezoid. There is no evidence of trauma, congenital defects, metabolic disorders or infectious or hematopoietic disease or infection at any of the sites.

Table 3.220: Statistical significance of pathologies observed on the carpals across all three sites

Carpal	**Chi Squared**
Scaphoid	p=0.559
Lunate	p=0.674
Hamate	p=0.505
Triquetral	CBA
Capitate	p=0.001, Cramer's V=50.6%
Trapezium	p=0.859
Trapezoid	p=0.049, Cramer's V=40.4%
Pisiform	CBA

3.2.16 Metacarpals

3.2.16.1 Souskiou-Laona

Of the total metacarpal sample examined, 64.7% is derived from Souskiou-*Laona*. Osteoarthritic changes and possible trauma are the only two types of pathology observed on the metacarpals. None of the subadult metacarpals examined display any evidence of pathology (Table 3.221).

Table 3.221: Percentage of metacarpals with pathology by age group from Souskiou-*Laona*

Age	**Count**	**Count with OA**	**Percent**	**Count with trauma**	**Percent**	**CBA for pathology**	**Percent**
Subadult	30	0	0.0	0	0.0	1	20.0
Adult	527	15	2.8	6	1.1	112	21.3
Total	557	15	2.7	6	1.1	113	20.3

Table 3.222 presents the percentage of pathology observed on each adult metacarpal derived from Souskiou-*Laona*[51]. The second metacarpal does not display any pathology. The greatest percentage of metacarpals recovered from Souskiou-*Laona* could not be identified in regards to digit or side due to taphonomic damage.

Table 3.222: Number of each carpal and percentage with osteoarthritic changes from Souskiou-*Laona*

Metacarpal			**Indeterminate**	**Left**	**Right**	**Total**
MC I	No pathology	Count	1	24	27	52
	Trauma observed	Count	0	3	2	5
		Percent	0.0	9.7	6.1	7.7
	OA observed	Count	0	4	4	8
		Percent	0.0	12.9	12.1	12.3
	Total	Count	1	31	33	65
MC II	No pathology	Count	0	28	31	59
	Trauma observed	Count	0	0	0	0
	OA observed	Count	0	0	0	0
	Total	Count	0	28	31	59
MC III	No pathology	Count	1	31	26	58
	Trauma observed	Count	0	0	0	0
	OA observed	Count	0	0	1	1
		Percent	0.0	0.0	3.7	1.7
	Total	Count	1	31	27	59
MC IV	No pathology	Count	2	26	21	48
	Trauma observed	Count	0	0	0	0
	OA observed	Count	0	1	1	2
		Percent	0.0	3.7	4.5	3.9
	Total	Count	2	27	22	51
MC V	No pathology	Count	1	13	25	39
	Trauma observed	Count	0	1	0	1
		Percent	0.0	6.7	0.0	2.4
	OA observed	Count	0	1	1	2
		Percent	0.0	6.7	3.8	4.8
	Total	Count	1	15	26	42
Indet MC	No pathology	Count	134	1	2	137
	Trauma observed	Count	0	0	0	0
	OA observed	Count	1	0	1	2
		Percent	0.7	0.0	33.3	1.4
	Total	Count	135	1	3	139

There are a minimum of 33 individuals at Souskiou-*Laona* represented within the metacarpal sample based on the right first metacarpal. There are six metacarpals

[51] Note that this does not include the 30 subadult metacarpals identified nor the 112 adult metacarpals which could not be assessed for pathology.

recorded with possible evidence of trauma, however there is no explicit evidence of fracture on any of the metacarpals. Those that are recorded with evidence of possible healed trauma represent a change in the morphology of the diaphysis or bone growth on one or both of the epiphyses. The left first metacarpal from Skeleton C Tomb 200 appears thickened and twisted laterally at the proximal epiphysis (Figure 3.123 and Figure 3.12 above). The left first metacarpal from Skeleton E Tomb 228 displays a depression in the proximal half on the palmar side of the diaphysis (Figure 3.124) and the right first metacarpal from the same context displays a 7mm osteophyte from the proximal epiphysis extending laterally and towards the palm and the proximal third of the diaphysis is twisted laterally (see Figure 3.13 above). A left first metacarpal from commingled context Tomb 125 displays a small osteophyte on the lateral side of the distal epiphysis and the diaphysis appears twisted (Figure 3.125). The right first metacarpal from Skeleton A Tomb 158 displays possible bone growth of the proximal third of the diaphysis which has made it thicker (see Figure 3.11 above). Finally, the left fifth metacarpal from East Skeleton Tomb 132 displays a 4mm long and 2.5mm bone ridge on the lateral-posterior surface near the proximal epiphysis which may represent a healed trauma. Radiographs are required to confirm whether the above described pathologies truly reflect incidences of trauma.

Figure 3.123: (Below left) Left first metacarpal (pictured with proximal first phalanx with small osteophyte indicated) with arrows indicating lateral twist in diaphysis and thickened diaphysis from Tomb 200 Skeleton C (palmar view, proximal is down).
Figure 3.124: (Below centre) Left first metacarpal from Tomb 228 Skeleton E with an arrow indicating the remodelled proximal diaphysis (palmar view, proximal is right).
Figure 2.125: (Below right) Left first metacarpal from Tomb 125 commingled with an arrow indicating the small osteophyte at the distal epiphysis (lateral view, proximal is up).



Osteoarthritic changes observed on the rest of the metacarpals appear as either bone growth or remodelling on the proximal and/or distal epiphyses. Table 3.223 presents the percentage of proximal and distal epiphyses displaying pathology for each metacarpal ray.

Table 3.223: Percentage of proximal and distal epiphyses with pathology for each metacarpal ray

Metacarpal	Proximal Epiphyses	PE with pathology	Percent	Distal Epiphyses	DE with pathology	Percent
MC I	43	6	14.0	49	5	10.2
MC II	46	0	0.0	34	0	0.0
MC III	47	1	2.1	29	0	0.0
MC IV	37	2	5.4	24	0	0.0
MC V	34	2	5.9	30	1	3.3
Indet MC	2	0	0.0	25	2	8.0

None of the metacarpals display significant differences in pathological expression based on side or sex determination. Table 3.224 presents the statistical analysis of the differences in pathological expression based on side for each metacarpal ray and number and difference in pathological expression based on sex.

Table 3.224: Significance analysis of pathological expression based on side and sex on metacarpals from Souskiou-*Laona*

Metacarpal	Side – Chi Squared	Male	Female	Sex – Chi Squared
MC I	p=0.496	4/8	3/12	p=0.109
MC II	N/A	0/8	0/13	N/A
MC III	p=0.537	0/10	0/13	N/A
MC IV	p=0.096	0/9	2/12	p=0.121
MC V	p=0.453	1/9	1/9	p=0.688
Indet MC	N/A	0/11	0/29	N/A

The other eight first metacarpals display osteoarthritic changes to the epiphyses with no evidence of trauma. A left first metacarpal from Bonestack E Tomb 158 displays osteophytic growth from the lateral condyle of the distal epiphysis, extending proximally 4mm (Figure 3.126). A right first metacarpal from the Bonestack Tomb 192 exhibits extension of the medial condyle of the distal epiphysis, extending proximally 3mm. The right first metacarpal of Skeleton West Tomb 132 displays remodelling of the lateral condyle of the distal epiphysis, changing the articular surface (Figure 3.127). The medial facet of the distal epiphysis of a left first metacarpal from Tomb 132 appears slightly flattened with some possible eburnation, and there is a patch of porous bone growth on the proximal third of the diaphysis. A left first metacarpal from Bonestack B Tomb 220 displays slight extension of the proximal articular surface distally directed to the lateral aspect (Figure 3.128). A right first metacarpal from the Bonestack Tomb 160 displays bone growth towards the palmar aspect on the margin of the proximal epiphysis with remodelling of the articular surface (Figure 3.129). The left first metacarpal of Skeleton East Tomb 132 displays mild osteophytic growth towards the palmar aspect on the proximal epiphysis with some porosity of the articular surface. The proximal epiphysis of the right first metacarpal from Skeleton C Tomb 200 displays osteophytic growth on the lateral margin, directed towards the palmar aspect.

Figure 3.126: (Below left) Left first metacarpal from Tomb 158 Bonestack E with osteophytic growth on the lateral condyle of the distal epiphysis indicated (lateral view, proximal is down).

Figure 3.127: (Below centre left) Right first metacarpal from Tomb 132 Skeleton West with bone growth on the lateral condyle of the distal epiphysis indicated, pictured with the right first proximal hand phalanx with mild osteophyte on the proximal epiphysis indicated (palmar view, proximal is down).

Figure 3.128: (Below centre right) Left first metacarpal from Tomb 220 Bonestack B with very mild bone growth and extension of the proximal articular surface indicated (palmar view, proximal is down).

Figure 3.129: (Below right) Right first metacarpal from Tomb 160 Bonestack with bone growth on the palmar aspect of the proximal epiphysis indicated (lateral view, proximal is down).




Osteoarthritic changes were observed on the styloid process of a right third metacarpal from the Northwest Bonestack Tomb 161 in the form of a proximally directed osteophyte, 6.2mm in length (Figure 3.130). The left and right fourth metacarpals from Skeleton A Tomb 192 both display bone growth and extension of the proximal articular surfaces, particularly the lateral facets (Figure 3.131). A left fifth metacarpal from the Bonestack Tomb 192 displays a small patch of rough bone growth on the lateral aspect of the proximal epiphysis, reflecting problems with articulation (Figure 3.132). The distal epiphysis of the right fifth metacarpal from Skeleton West Tomb 132 appears remodelled and flattened which would have impacted articulation (Figure 3.133).

Figure 3.130: (Below left) Right third metacarpal from Tomb 161 Northwest Bonestack with osteophytic growth indicated (medial view, proximal is down).

Figure 3.131: (Below right) Left (left side) and right (right side) fourth metacarpals from Tomb 192 Skeleton A with remodelling and bone growth indicated (lateral view, proximal is down).

Figure 3.132: (Far left) Left fifth metacarpal from Tomb 192 Bonestack with a small patch of rough bone on the lateral aspect indicated (palmar view, proximal is down).

Figure 3.133: (Left) Right fifth metacarpal from Tomb132 Skeleton West with remodelled proximal articular surface indicated (palmar view, proximal is down).

The greatest proportion of metacarpals observed at Souskiou-*Laona* are unidentified in regards to digit number due to taphonomic damage. Identification impossible in 72.3% cases as they do not have any epiphyses, which also affects the observers ability to assess for osteoarthritic changes. Two indeterminate metacarpals display osteoarthritic changes to the distal epiphysis. One surface of the distal epiphysis of an indeterminate metacarpal from Bonestack E Tomb 158 displays a 10mm osteophyte, proximally directed (Figure 3.134). The distal epiphysis of an indeterminate metacarpal from Skeleton E Tomb 193 appears flattened with some mild osteophytic growth (Figure 3.135). Overall, there is no evidence of infection, congenital defects, metabolic disorders or infectious or hematopoietic diseases on the metacarpals observed from Souskiou-*Laona*.

Figure 3.134: (Far left) Indeterminate metacarpal from Tomb 158 Bonestack E with bone growth and extension of the articular facet of the distal epiphysis indicated (lateral or medial view, distal is top).

Figure 3.135: (Left) Indeterminate metacarpal from Tomb 193 Skeleton E with a remodelled distal epiphysis indicated (palmar view, proximal is down).

3.2.16.2 Lemba-Lakkous

Of the total metacarpal sample examined, 11.5% is derived from Lemba-*Lakkous*. There were no pathologies observed on any of the metacarpals from Lemba-*Lakkous*. Table 3.225 provides the percentage of metacarpals observed based on age group.

Table 3.225: Percentage of metacarpals observed at Lemba-*Lakkous*

Age	**Count**	**Percent**	**CBA for pathology**	**Percent**
Subadult	46	46.5	4	8.7
Adult	53	53.5	19	35.8
Total	99	100.0	23	23.2

Table 3.226 presents the adult metacarpals by digit number and side identified from Lemba-*Lakkous*[52]. Preservation of the metacarpals from Lemba-*Lakkous* is quite poor, as 60.4% are fragmented and typically quite incomplete. Of the metacarpals from Lemba-*Lakkous,* 62.3% do not have either epiphysis present which directly impacts the ability to observe osteoarthritic changes.

[52] Note that this does not include the 46 subadult metacarpals or the 19 adult metacarpals which could not be assessed for pathology.

Table 3.226: Number of adult metacarpals by side for each digit from Lemba-*Lakkous*

Metacarpal		Indeterminate	Left	Right	Total
MC I	Total	0	4	3	7
MC II	Total	0	2	4	6
MC III	Total	0	4	3	7
MC IV	Total	0	0	1	1
MC V	Total	0	1	3	4
Indet MC	Total	9	0	0	9

There are minimally four discrete adult skeletons represented within the metacarpal sample based on the left first and third and right second metacarpals. There is no evidence of trauma, osteoarthritic changes, infection, congenital defects, metabolic disorders or infectious or hematopoietic diseases on any of the metacarpals from Lemba-*Lakkous*.

3.2.16.3 Kissonerga-Mosphilia

Of the total metacarpal sample examined, 23.8% is derived from Kissonerga-*Mosphilia*. Osteoarthritic change is the only type of pathology observed on the metacarpals at Kissonerga-*Mosphilia*. None of the subadult metacarpals display any evidence of pathology (Table 3.227).

Table 3.227: Percentage of metacarpals with pathology by age group from Kissonerga-*Mosphilia*

Age	Count	Count with OA	Percent	CBA for pathology	Percent
Subadult	116	0	0.0	6	5.2
Adult	89	1	1.1	40	44.9
Total	205	1	0.5	46	22.4

Table 3.228 presents the percentage of pathology observed on each adult metacarpal digit derived from Kissonerga-*Mosphilia*[53].Only a single first metacarpal displays evidence of pathology.

[53] Note that this does not include the 116 subadult metacarpals identified nor the 40 adult metacarpals which could not be assessed for pathology.

Table 3.228: Number of adult metacarpals with pathology by side for each digit from Kissonerga-*Mosphilia*

Metacarpal			Indeterminate	Left	Right	Total
MC I	No pathology	Count	0	4	5	9
	OA observed	Count	0	0	1	1
		Percent	0	0.0	16.7	10.0
	Total	Count	0	4	6	10
MC II	Total	Count	0	4	6	10
MC III	Total	Count	0	5	6	11
MC IV	Total	Count	2	4	4	10
MC V	Total	Count	0	4	3	7
Indet MC	Total	Count	2	0	0	2

Figure 3.136: Right first metacarpal from Grave 571 with mild osteophytic growth indicated (medial view, proximal is down).

There is a minimum of six adult skeletons represented within the metacarpal sample based on the right first, second and third metacarpals. The sole right first metacarpal with pathology is from Grave 571, and displays osteophytic growth extending 4mm proximally from the lateral condyle of the distal epiphysis (Figure 3.136). There is no statistically significant difference in pathological expression on the first metacarpals based on side (Chi Squared p=0.532). There is no statistically significant difference in pathological expression on the first metacarpals between the sexes (Chi Squared p=0.657). Therefore, the osteophytic growth affects only 12.5% (n=1) of the eight first metacarpal distal epiphyses examined from Kissonerga-*Mosphilia* display pathology. There is no evidence of pathology on any of the other metacarpal digits. Therefore, there is no evidence of trauma, infection, congenital defect, metabolic disorder or infectious or hematopoietic disease on any of the metacarpals from Kissonerga-*Mosphilia*.

3.2.16.4 Comparison

There is a statistically significant difference in pathological expression on the metacarpals across the three sites, with Souskiou-*Laona* displaying a far higher frequency of expression than the other two sites (Chi Squared p=0.007, Cramer's V=10.8%). When this is examined further, interestingly there is a statistically significant difference in pathological expression between Souskiou-*Laona* and

Kissonerga-*Mosphilia*, however, while very close to being so, there is no significance difference between Souskiou-*Laona* and Lemba-*Lakkous*[54]. When each metacarpal digit is compared across the three sites, there is no statistically significant difference in pathological expression across the three sites[55]. There is no statistically significant difference in pathological expression between the sexes across the sites. In other words, there is no difference between the frequency of expression of pathologies on the metacarpals for females at the three sites. While there is possible evidence of trauma with non-active remodelling of several of the bones, predominately the pathologies observed reflect osteoarthritic changes. There is no evidence of infection, congenital defect, metabolic disorder or infectious or hematopoietic disease on any of the metacarpals across the three sites.

3.2.17 Hand phalanges

The discussion of the hand phalanges is organized by the different phalanges. Overall, recovery was moderate, given that the expected number of hand phalanges based on the MNI of 263 is 7364 phalanges, the recovery rate is about 21.5% (n=1583). Table 3.229 provides a breakdown of the hand phalanges from each site.

Table 3.229: Hand phalanges derived from the three sites

Hand Phalanges		**Souskiou-*Laona***	**Lemba-*Lakkous***	**Kissonerga-*Mosphilia***	**Total**
1st Proximal Phalanx	Count	33	9	11	53
	% of phalanges	62.3%	17.0%	20.8%	100.0%
Proximal Phalanges	Count	404	91	144	639
	% of phalanges	63.2%	14.2%	22.5%	100.0%
Intermediate Phalanges	Count	280	63	87	430
	% of phalanges	65.1%	14.7%	20.2%	100.0%
1st Distal Phalanx	Count	28	8	14	50
	% of phalanges	56.0%	16.0%	28.0%	100.0%
Distal Phalanx	Count	191	40	52	283
	% of phalanges	67.5%	14.1%	18.4%	100.0%
Indet Phalanges	Count	101	14	13	128
	% of phalanges	78.9%	10.9%	10.2%	100.0%
Total	Count	1037	225	321	1583
	% of phalanges	65.0%	14.1%	20.9%	100.0%

[54] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.063, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.023 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.967.

[55] Chi Squared tests: MC1 – p=0.282; MC2 – could not be assessed as no second metacarpals display pathology; MC3 – p=0.831; MC4 – p=0.629; MC5 – p=0.626; Indeterminate MC – p=0.810.

3.2.17.1 Proximal Hand Phalanges

3.2.17.1.1 Souskiou-Laona

Table 3.230 presents the percentage of first proximal and proximal (digits two through five) hand phalanges which were examined and displayed pathology from Souskiou-*Laona*. Osteoarthritic changes and trauma are the only types of pathology observed. None of the subadult proximal hand phalanges display any evidence of pathology.

Table 3.230: Percentage of the proximal hand phalanges with pathology from Souskiou-*Laona*

Phalanx	**Age Group**	**Count**	**Count with OA**	**Percent**	**Count with trauma**	**Percent**	**CBA for pathology**	**Percent**
First Proximal	Subadult	3	0	0.0	0	0.0	0	0.0
	Adult	30	2	6.7	0	0.0	0	0.0
	Total	33	2	6.1	0	0.0	0	0.0
Proximal (2-5)	Subadult	30	0	0.0	0	0.0	0	0.0
	Adult	374	0	0.0	2	0.5	42	11.2
	Total	404	0	0.0	2	0.5	42	10.4

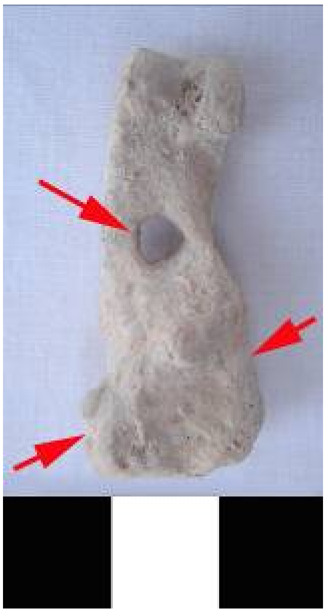
Both proximal first phalanges from Souskiou-*Laona* display osteophytic growth on the margins of the proximal epiphysis. The right first proximal hand phalanx from Skeleton West Tomb 132 displays a small (c.1mm) osteophyte on the proximal-lateral margin of the proximal epiphysis (see Figure 3.127 above). The left first proximal hand phalanx from Skeleton C Tomb 200 displays a small ‘bulb-shaped’ osteophyte projecting from the proximal epiphysis towards the dorsal aspect on the proximal medial margin (see Figure 3.123 above). Table 3.231 presents the percentage of adult first proximal hand phalanges with pathology based on side and sex.

Table 3.231: Percentage of adult first proximal hand phalanges with pathology from Souskiou-*Laona*

Side/Sex	**Count**	**Count with OA**	**Percent**
Right	15	1	6.7
Left	11	1	9.1
Indeterminate	4	0	0.0
Male	2	1	50.0
Female	2	1	50.0

Both affected proximal hand phalanges from digits two through five display evidence of healed fracture which has severely affected the morphology of the bone. The phalanx from Skeleton A Tomb 192 displays a Boutonniere deformity which has

Figure 3.137: Proximal hand phalanx from Tomb 192 Bonestack with cloaca and bone callous indicated (palmar view, distal is up).



ankylosed the proximal and intermediate phalanges in a fixed curve (see Figure 3.16 above). The phalanx from Bonestack Tomb 192 exhibits a large bone callous and cloaca in the middle of the phalanx indicates a mal-healed fracture which resulted in an infection in the bone (Figure 3.137). Interestingly, both these phalanges occur in the same burial context. There is no evidence of degenerative joint changes on any of the proximal hand phalanges for digits two through five at Souskiou-*Laona*.

3.2.17.1.2 Lemba-Lakkous

Table 3.232 presents the percentage of first proximal and proximal (digits two through five) hand phalanges which were examined and displayed pathology at Lemba-*Lakkous*. None of the proximal hand phalanges display any evidence of pathology.

Table 3.232: Percentage of the proximal hand phalanges with pathology from Lemba-*Lakkous*

Phalanx	**Age Group**	**Count**	**Count with pathology**	**Percent**	**CBA for pathology**	**Percent**
First Proximal	Subadult	3	0	0.0	1	33.3
	Adult	6	0	0.0	0	0.0
	Total	9	0	0.0	0	0.0
Proximal (2-5)	Subadult	46	0	0.0	3	6.5
	Adult	45	0	0.0	11	24.4
	Total	91	0	0.0	14	15.4

3.2.17.1.3 Kissonerga-Mosphilia

Table 3.233 presents the percentage of first proximal and proximal (digits two through five) hand phalanges which were examined and displayed pathology at Kissonerga-*Mosphilia*. None of the proximal hand phalanges display any evidence of pathology.

Table 3.233: Percentage of the proximal hand phalanges with pathology from Kissonerga-*Mosphilia*

Phalanx	**Age Group**	**Count**	**Count with pathology**	**Percent**	**CBA for pathology**	**Percent**
First Proximal	Subadult	5	0	0.0	0	0.0
	Adult	6	0	0.0	0	0.0
	Total	11	0	0.0	0	0.0
Proximal (2-5)	Subadult	82	0	0.0	6	7.3
	Adult	62	0	0.0	10	16.1
	Total	144	0	0.0	16	11.1

3.2.17.1.4 Comparison

Souskiou-*Laona* is the only site of the three with proximal hand phalanges which pathology. This occurs as osteoarthritic changes to two of the proximal epiphyses of the proximal first phalanx and trauma to two proximal phalanges of the second through fifth digits. There is no statistically significant difference in pathological expression on the proximal hand phalanges across the three sites (Chi Squared p=0.309). Comparison based on males and females is not particularly relevant given the small percentage of phalanges affected and the results based on side do not reflect any significant difference in pathological expression. There is no evidence for congenital defects or metabolic disorders or infectious or hematopoietic disease.

3.2.17.2 Intermediate Hand Phalanges

3.2.17.2.1 Souskiou-Laona

Table 3.234 presents the percentage of intermediate hand phalanges which were examined and displayed pathology from Souskiou-*Laona*. Osteoarthritic changes and possible trauma are the only types of pathology observed. None of the subadult intermediate hand phalanges display any evidence of pathology.

Table 3.234: Percentage of the intermediate hand phalanges with pathology from Souskiou-*Laona*

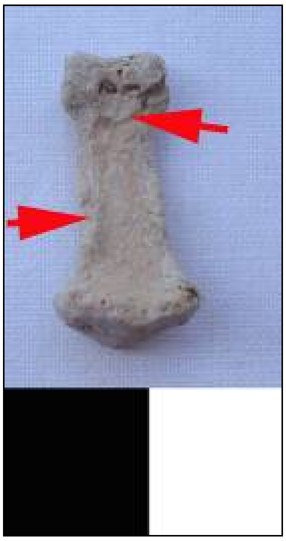
Age Group	**Count**	**Count with OA**	**Percent**	**Count with trauma**	**Percent**	**CBA for pathology**	**Percent**
Subadult	11	0	0.0	0	0.0	0	0.0
Adult	269	1	0.4	2	0.7	35	13.0
Total	280	1	0.4	2	0.7	35	12.5

Of the three phalanges affected, two display osteophytic growth at the proximal epiphysis. An intermediate phalanx from the commingled context, quadrant one Tomb 125 displays changes in morphology, possibly due to trauma, with a palmar curve and thinner diaphysis along with mild osteophytic growth at the margins of the proximal epiphysis (Figure 3.138). There is mild osteophytic growth along the margin of the proximal epiphysis and the side ridge of the diaphysis of an intermediate phalanx from the Bonestack Tomb 192 reflecting osteoarthritic changes (Figure 3.139). The third intermediate phalanx, from Skeleton A Tomb 192, displays osteophytic growth on the distal epiphysis which likely reflects ankylosis of the distal phalanx much of which is lost post-mortem (Figure 3.140).

Figure 3.138: (Below left) Intermediate hand phalanx from Tomb 125 commingled displays an accentuated palmar curve and very mild bone growth at the distal epiphysis and diaphysis indicated (palmar view, proximal is down).

Figure 3.139: (Below centre) Intermediate hand phalanx from Tomb 192 Bonestack with mild osteophytic growth indicated (palmar view, proximal is down).

Figure 3.140: (Below right) Intermediate hand phalanx from Tomb 192 Skeleton A with ankylosed distal phalanx indicated (palmar view, proximal is down).



3.2.17.2.2 Lemba-Lakkous

Table 3.235 presents the percentage of intermediate hand phalanges which were examined from Lemba-*Lakkous*. None of the intermediate hand phalanges display any evidence of pathology.

Table 3.235: Percentage of the intermediate hand phalanges examined from Lemba-*Lakkous*

Age Group	**Count**	**Count with pathology**	**Percent**	**CBA for pathology**	**Percent**
Subadult	24	0	0.0	0	0.0
Adult	39	0	0.0	8	20.5
Total	63	0	0.0	8	12.7

3.2.17.2.3 Kissonerga-Mosphilia

Table 3.236 presents the percentage of intermediate hand phalanges which were examined from Kissonerga-*Mosphilia*. None of the intermediate hand phalanges display any evidence of pathology.

Table 3.236: Percentage of the intermediate hand phalanges examined from Kissonerga-*Mosphilia*

Age Group	**Count**	**Count with pathology**	**Percent**	**CBA for pathology**	**Percent**
Subadult	43	0	0.0	0	0.0
Adult	44	0	0.0	5	11.4
Total	87	0	0.0	5	5.7

3.2.17.2.4 Comparison

Overall, very few intermediate hand phalanges display pathology, all of which occur at Souskiou-*Laona*. This does not reflect a statistically significant difference in pathological expression on the intermediate phalanges across the three sites (Chi Squared p=0.445). There is possible evidence of trauma and osteoarthritic changes and no evidence for infection, congenital defects or metabolic or infectious or hematopoietic disease.

3.2.17.3 Distal Hand Phalanges

3.2.17.3.1 Souskiou-Laona

Table 3.237 presents the percentage of first distal and distal (digits two through five) hand phalanges which were examined and displayed pathology from Souskiou-*Laona*. Osteoarthritic changes is the only type of pathology observed. None of the subadult distal hand phalanges display any evidence of pathology.

Table 3.237: Percentage of the distal hand phalanges with pathology from Souskiou-*Laona*

Phalanx	Age Group	Count	Count with OA	Percent	CBA for pathology	Percent
First Distal	Subadult	2	0	0.0	0	0.0
	Adult	26	1	3.8	0	0.0
	Total	28	1	3.6	0	0.0
Distal (2-5)	Subadult	8	0	0.0	0	0.0
	Adult	183	9	4.9	6	3.3
	Total	191	9	4.7	6	3.1

Figure 3.141: Left distal first hand phalanx (on left side with non-pathological distal first hand phalanx on right) with flattened distal end indicated (dorsal view, distal is up).

The distal half of the left distal first hand phalanx from Bonestack C Tomb 220 is remodelled and quite flat, there is no evidence of trauma however the aetiology of this change in morphology is uncertain (Figure 3.141). Table 3.238 presents the percentage of adult first proximal hand phalanges with pathology based on side. As most of the distal hand phalanges were recovered from commingled contexts, it was not possible to discuss pathological difference based on sex.

Table 3.238: Percentage of adult first distal hand phalanges with pathology by side from Souskiou-*Laona*

Side	Count	Count with OA	Percent
Right	9	0	0.0
Left	6	1	16.7
Indeterminate	11	0	0.0

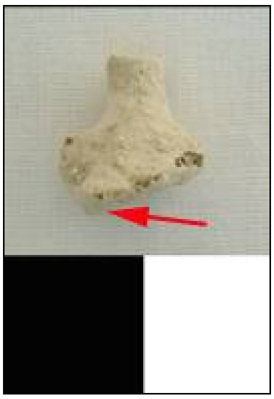


Figure 3.142: (Far left) distal hand phalanges from Tomb 220 Bonestack D with mild osteophytic growth indicated (proximal view, distal is up).

Figure 3.143: (Left) Distal hand phalanx from Tomb 158 Bonestack E with bone growth indicated (dorsal view, distal is up).

All the distal hand phalanges for digits two through five with pathology, display evidence of osteoarthritic changes in the form of osteophytic growth of the proximal epiphysis or extension of the distal epiphysis. Two distal hand phalanges from the Bonestack Tomb 192 display bone growth of the distal epiphysis and mild osteophytic growth at the margin of the proximal epiphysis. Four distal hand phalanges from Bonestack D Tomb 220 display osteophytes projecting from the margins of the proximal epiphysis (Figure 3.142). A distal hand phalanx from Bonestack C Tomb 220 also displays a small osteophyte proximally directed from the proximal epiphysis. The proximal epiphysis of a distal hand phalanx from Bonestack E Tomb 158 displays a small 'globular' bone growth to one aspect (Figure 3.143). Finally, a distal hand phalanx from the commingled context Tomb 165 displays bone growth on the plantar surface extending from the distal epiphysis towards the proximal end. Table 3.239 presents the percentage of proximal and distal epiphyses of the distal hand phalanges which display pathology. There is no evidence of trauma, infection, metabolic disorders or infectious or hematopoietic disease or congenital defect on any of the distal hand phalanges from Souskiou-*Laona*.

Table 3.239: Percentage of proximal and distal epiphyses of the distal hand phalanges with pathology from Souskiou-*Laona*

Part	**Count**	**Count with OA**	**Percent**
Proximal Epiphysis	161	8	5.0
Distal Epiphysis	147	3	2.0

3.2.17.3.2 Lemba-Lakkous

Table 3.240 presents the percentage of first distal and distal (digits two through five) hand phalanges which were examined and displayed pathology from Lemba-*Lakkous*. Possible trauma is the only type of pathology observed. None of the subadult distal hand phalanges display any evidence of pathology.

Table 3.240: Percentage of the distal hand phalanges with pathology from Lemba-*Lakkous*

Phalanx	**Age Group**	**Count**	**Count with trauma**	**Percent**	**CBA for pathology**	**Percent**
First Distal	Subadult	1	0	0.0	0	0.0
	Adult	7	0	0.0	0	0.0
	Total	8	0	0.0	0	0.0
Distal (2-5)	Subadult	10	0	0.0	2	20.0
	Adult	30	1	3.3	0	0.0
	Total	40	1	2.5	2	5.0

A distal phalanx from Grave 30 displays bone growth along the diaphysis to the proximal epiphysis and may represent a trauma which formed a bony callous (see Figure 3.33 above). A radiograph may be helpful in determining if this is the case. There is no evidence of osteoarthritic changes, infection, metabolic disorders or infectious or hematopoietic disease or congenital defect on any of the distal hand phalanges for digits two through five at Lemba-*Lakkous*.

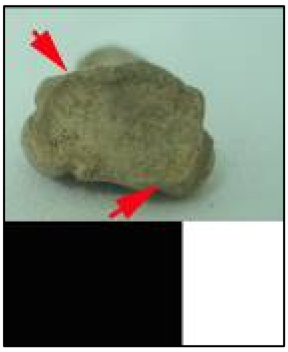
3.2.17.3.3 Kissonerga-Mosphilia

Table 3.241 presents the percentage of first distal and distal (digits two through five) hand phalanges which were examined and displayed pathology from Kissonerga-*Mosphilia*. Osteoarthritic changes to the proximal epiphysis is the only type of pathology observed. None of the subadult distal hand phalanges display any evidence of pathology.

Table 3.241: Percentage of the distal hand phalanges with pathology from Kissonerga-*Mosphilia*

Phalanx	**Age Group**	**Count**	**Count with OA**	**Percent**	**CBA for pathology**	**Percent**
First Distal	Subadult	6	0	0.0	0	0.0
	Adult	8	1	12.5	1	12.5
	Total	14	1	7.1	1	7.1
Distal (2-5)	Subadult	27	0	0.0	0	0.0
	Adult	25	0	0.0	1	4.0
	Total	52	0	0.0	1	1.9

Figure 3.144: Distal hand phalanx from Grave 571 with very mild osteophytic growth indicated (proximal view, dorsal is up)



The indeterminate distal first hand phalanx from Grave 571, belongs to a female and displays very mild osteophytic growth from the margins of the proximal epiphysis (Figure 3.144). There is no evidence of trauma, infection, congenital defects, metabolic disorder or infectious or hematopoietic disease on any of the distal hand phalanges at Kissonerga-*Mosphilia*.

3.2.17.3.4 Comparison

There is no statistically significant difference in pathological expression on the distal first digit hand phalanx across the three sites (Chi Squared p=0.702). Nor was there any statistically significant difference in pathologies observed on the distal hand phalanges for the other digits across the three sites (Chi Squared p=0.246). The proximal epiphysis is affected among 75.0% of all twelve of the distal had phalanges with pathology and the distal epiphysis is affected in 33.3% of all the distal hand phalanges with pathology, where two of the phalanges display pathology on both the proximal and distal epiphyses. Predominantly, this reflects osteoarthritic changes in the form of bone growth at the epiphyses or trauma with thickening of the diaphyses.

3.2.18 Sternum

Only one sternum from Souskiou-*Laona* displays possible osteoarthritic changes. None of the sterna from Lemba-*Lakkous* or Kissonerga-*Mosphilia* display pathology. Table 3.242 presents the number of sterna derived from each site and the low levels of preservation within each site. The majority of the sterna were incomplete with poor surface condition.

Table 3.242: Percentage of sterna observed and assessed across the three sites

Site	**Count**	**Percent**	**Percent >25% complete**	**Percent with preservation level 3 - 5**	**Percent CBA for pathology**	**Count with OA**	**Percent with OA**
Souskiou-*Laona*	14	58.3	64.3	64.2	14.3	1	7.1
Lemba-*Lakkous*	1	4.2	100.0	100.0	100.0	0	0.0
Kissonerga-*Mosphilia*	9	37.5	44.4	66.7	22.2	0	0.0

Figure 3.145: Close up detail of a sternum from Tomb 220 Bonestack B with porosity and bone growth at the margins of the costal notch indicated (lateral view, anterior is up).

The single pathological sternum from Bonestack B Tomb 220 displays osteophytic growth at the margins of the costal notches and some mild porosity reflecting a degenerative change to the bone (Figure 3.145). There is no statistically significant difference in pathological expression on the sternum across the three sites (Chi Squared p=0.689).

3.2.19 Ribs

As discussed above, due to the fragmentary nature of ribs and the commingling of some of the skeletal material, it is impossible to know the actual number of discrete ribs present[56]. This discussion will focus on the first and second ribs as they are distinct from the rest of the ribs and there is only two of each per skeleton.

3.2.19.1 First Rib

3.2.19.1.1 Souskiou-Laona

Of all first ribs examined, 49.5% are derived from Souskiou-*Laona*. Table 3.243 presents the percentage of first ribs examined with pathology from Souskiou-*Laona*. The only pathology type observed reflects osteoarthritic changes to the articular facet. None of the subadult first ribs display pathology.

Table 2.243: Percentage of first ribs with pathology from Souskiou-*Laona*

Age Group	**Count**	**Count with OA**	**Percent**	**CBA for pathology**	**Percent**
Subadult	2	0	0.0	0	0.0
Adult	51	1	2.0	4	7.8
Total	53	1	1.9	4	7.5

Table 3.244 presents the percentage of adult first ribs with pathology by side. There is no significant difference in pathological expression based on the side of the rib (Chi Squared p=0.537). Analysis based on sex is not possible as the rib which displays pathology does not have an assessed sex.

Table 3.244: Percentage of adult first ribs with pathology by side from Souskiou-*Laona*

Side	**Count**	**Percent with OA**
Left	23	4.3
Right	21	0.0
Indeterminate	7	0.0

A left first rib from Bonestack E Tomb 192 displays mild osteophytic growth at the margins of the costovertebral articular facet, reflecting degenerative joint changes (Figure 3.146). There is no evidence of trauma, congenital defect, infection, metabolic disorders, infectious or hematopoietic disease.

[56] Please see the discussion below based on tomb groups for the analysis of the presence or absence of rib pathologies within these samples. The ribs were very fragmentary and in many cases, assessment of pathology was not possible.

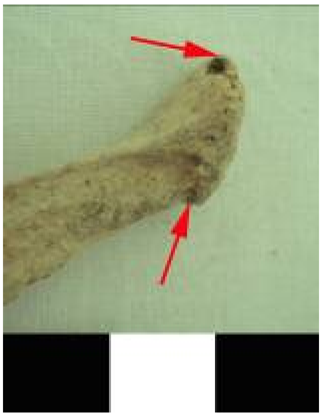


Figure 3.146: Left first rib from Tomb 192 Bonestack E with very mild bone growth along the margins of the costovertebral articular facet indicated (inferior view, posterior end is to the right).

3.2.19.1.2 Lemba-Lakkous

Of all first ribs examined, 16.8% are derived from Lemba-*Lakkous*. Table 3.245 presents the percentage of first ribs examined from Lemba-*Lakkous*. None of the first ribs examined from Lemba-*Lakkous* display any evidence of pathology.

Table 2.245: Percentage of first ribs examined from Lemba-*Lakkous*

Age Group	**Count**	**Count with pathology**	**Percent**	**CBA for pathology**	**Percent**
Subadult	13	0	0.0	2	15.4
Adult	5	0	0.0	0	0.0
Total	18	0	0.0	2	11.1

3.2.19.1.3 Kissonerga-Mosphilia

Of all first ribs examined, 33.6% are derived from Kissonerga-*Mosphilia*. Table 3.246 presents the percentage of first ribs examined with pathology from Kissonerga-*Mosphilia*. The only pathology type observed reflects osteoarthritic changes to the articular facet. None of the subadult first ribs display pathology.

Table 2.246: Percentage of first ribs with pathology from Kissonerga-*Mosphilia*

Age Group	**Count**	**Count with OA**	**Percent**	**CBA for pathology**	**Percent**
Subadult	24	0	0.0	2	8.3
Adult	12	2	16.7	2	16.7
Total	36	2	5.6	4	11.1

Table 3.247 presents the percentage of adult first ribs with pathology by side. There is no significant difference in pathological expression on the first rib based on side (Chi Squared p=0.488). There is no statistically significant difference in pathological expression based on sex (Chi Squared p=0.301).

Table 3.247: Percentage of adult first ribs with pathology by side from Kissonerga-*Mosphilia*

Side	Count	Percent with OA
Left	8	25.0
Right	2	0.0

The left first ribs from Skeleton A Grave 515 and Skeleton C Tomb 505 both display osteophytic growth, inferiorly directed, at the margin of the costovertebral articular facet, reflecting degenerative changes to the joint (Figures 3.147 and 3.148, respectively).

Figure 3.147: (Left) Left first rib from Grave 515 Skeleton A with mild osteophytic growth indicated at the costovertebral articular facet (superior view, posterior is down).

Figure 3.148: (Right) Left first rib from Tomb 505 Skeleton C with mild bone growth indicated at costovertebral articular facet (inferior view, posterior is down).

3.2.19.1.4 Comparison

Very few first ribs display any evidence of pathology across the three sites. There is no statistically significant difference in pathological expression of the first rib across the three sites, even when compared by side (Chi Squared p=0.431, p=0.228 respectively). All pathologies observed indicate degenerative changes to the costovertebral joint with osteophytic growth on an articular facet of the first rib. There is no evidence of trauma, congenital defect, infection, metabolic disorder or infectious or hematopoietic disease on any of the first ribs observed.

3.2.19.2 Second Rib

None of the second ribs examined from any of the sites displayed any evidence of pathology. Table 3.248 presents the percentage of second ribs from each site.

Table 3.248: Percentage of second ribs observed from all three sites

Site	Count	Percent	Percent of subadult	Percent CBA for pathology
Souskiou-*Laona*	10	76.9	0.0	10.0
Lemba-*Lakkous*	0	0.0	0.0	0.0
Kissonerga-*Mosphilia*	3	23.1	66.7	0.0

3.2.20 Femur

3.2.20.1 Souskiou-Laona

Of the total femoral elements examined, 61.9% are derived from Souskiou-*Laona*. Table 3.249 presents the percentage of femora which were examined. Osteoarthritic changes are the most prevalent pathology type observed on the femora at Souskiou-*Laona*, with one bone displaying pathology of unknown aetiology. None of the subadult femora observed display any evidence of pathology (Table 3.250).

Table 3.249: Percentage of femoral elements which were assessed from Souskiou-*Laona*

Assessment	Count	Percent
CBA	130	51.4
Pathology	4	1.6
No pathology	119	47.0
Totals	253	100.0

Table 3.250: Percentage of femoral elements with pathology by age group from Souskiou-*Laona*

Age	Count	Count with OA	Percent	Count with other pathology	Percent
Subadult	8	0	0.0	0	0.0
Adult	115	3	2.6	1	0.9
Total	123	3	2.4	1	0.8

In order to ensure there was no double counting of the same femur in fragments within the same tomb, the minimum number of adult elements was tabulated and used to discuss prevalence[57]. Table 3.251 presents the minimum number of adult femora derived from Souskiou-*Laona* and the percentage with pathology, based on side. Only left femora and one unsided distal femur display pathology. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.239). All of the femora with pathology are from bonestack contexts and none are provided with a sex determination.

[57] The minimum number of elements was arrived at by cross-tabulating the side and the portion of the bone present and examining them by tomb context. This is to avoid double counting any bones. This does not include bones for which a side could not be determined as these were typically highly fragmentary making it difficult to determine the percentage of the bone present and how many discrete elements are present. This number is artificially low for the femora as they were so poorly preserved in general that the proximal and distal epiphyses were not often recovered. 43.7% of all recorded femora are less than 25% complete and 62.4% are very fragmentary or with no recognizable fragments.

Table 3.251: Minimum number of femora and percentage with pathology by side from Souskiou-*Laona*

Side	Count	Count with pathology	Percent
Left	46	3	6.5
Right	45	0	0.0

Three of the four pathologies observed on the femora reflect osteoarthritic changes, two of which affect the distal epiphysis and one affects the proximal epiphysis. Table 3.252 presents the percentage of the proximal and distal epiphyses observed with osteoarthritic changes.

Table 3.252: Percentage of the proximal and distal epiphyses with osteoarthritic changes from Souskiou-*Laona*

Bone Part	Count Present	Count with OA	Percent
Proximal epiphysis	38	1	2.6
Distal epiphysis	30	2	6.7

The distal epiphysis of an indeterminate femur from Bonestack Tomb 192 displays a small osteophyte (7mm long, 1.5mm high) on one of the condyles (Figure 3.149). A left femur from Bonestack Tomb 200 displays mild osteophytic growth on the distal epiphysis, along the anterior surface of the proximal aspect of the patellar articular surface (Figure 3.150). The proximal epiphysis of a left femur from Bonestack E Tomb 158 displays bone growth which extends the articular surface laterally from the superior-anterior aspect (Figure 3.151). The fourth femur with pathology is a left from the commingled context quadrant IV Tomb 125 and displays an unusual curve (possible cortical thickening) in the proximal third of the diaphysis which may reflect evidence of trauma or a possible metabolic disorder or infectious or hematopoietic disease which has affected the cortical thickness of the bone (Figure 3.152). There is no evidence of congenital defect or infection and no certain evidence of fracture, though a radiograph is needed to confirm this in one case.

Figure 3.149: (Above left) Unsided femur fragment from Tomb 192 Bonestack with a small bone growth indicated on the distal epiphysis articular surface (distal view).

Figure 3.150: (Above right) Left femur from Tomb 200 Bonestack with osteophytic growth at the margins of the distal epiphysis articular surface indicated (anterior view, distal is down).

Figure 3.151: (Far left) Left femur from Tomb 158 Bonestack E with mild bone growth on the superior-anterior aspect of the proximal epiphysis indicated (anterior view, proximal is up, medial is left).

Figure 3.152: (Left) Left femur with an unusual lateral curve in the diaphysis as indicated by the arrows (posterior view, proximal is up).

3.2.20.2 Lemba-Lakkous

Of the total femora elements examined, 15.6% are derived from Lemba-*Lakkous*. Table 3.253 presents the percentage of femoral elements which were examined. None of the femora from the Lemba-*Lakkous* display any evidence of pathology. Table 3.254 presents the percentage of femora by age.

Table 3.253: Percentage of femoral elements which were assessed from Lemba-*Lakkous*

Assessment	**Count**	**Percent**
CBA	21	32.8
Pathology	0	0.0
No pathology	43	67.2
Totals	64	100.0

Table 3.254: Percentage of femoral elements by age group from Lemba-*Lakkous*

Age	**Count**	**Percent**
Subadult	29	67.4
Adult	14	32.6
Total	43	100.0

3.2.20.3 Kissonerga-Mosphilia

Of the total femoral elements examined, 22.5% are derived from Kissonerga-*Mosphilia*. Table 3.255 presents the percentage of femora which were examined. Evidence of a possible disease or disorder is the only type of pathology observed on the femora from Kissonerga-*Mosphilia*. None of the adult femora observed display any evidence of pathology (Table 3.256).

Table 3.255: Percentage of femoral elements which were assessed from Kissonerga-*Mosphilia*

Assessment	**Count**	**Percent**
CBA	35	38.0
Pathology	2	2.2
No pathology	55	59.8
Totals	92	100.0

Table 3.256: Percentage of femoral elements with pathology by age group from Kissonerga-*Mosphilia*

Age	**Count**	**Count with disease**	**Percent**
Subadult	42	2	4.8
Adult	15	0	0.0
Total	57	2	3.5

In order to ensure that there was no double counting of the same femur in fragments within the same tomb, the minimum number of subadult elements was tabulated and used to discuss prevalence (see above footnote 45). Table 3.257 presents the minimum number of subadult femora derived from Kissonerga-*Mosphilia* and the percentage with pathology, based on side.

Table 3.257: Minimum number of subadult femora and percentage with pathology by side from Kissonerga-*Mosphilia*

Side	**Count**	**Count with pathology**	**Percent**
Left	18	1	5.6
Right	13	1	7.7

Both femora are derived from the same individual in Grave 532 and display bowing of the proximal third of the diaphysis in a mild S-shape and there are small lesions on the lateral side in the proximal third of the bone (Figures 3.153 and 3.154). There is no evidence of osteoarthritic changes, trauma, infection or congenital defect.

Figure 3.153: (Left) Right femur (on left side of image) from Grave 532 with slight bowing of the diaphysis indicated by the arrow (posterior view, proximal is up). Pictured with an adult femur with no pathology observed, on the right.

Figure 3.154: (Above) Close up detail of right femur from Grave 532 with lesions indicated (lateral view, proximal is to right).

3.2.20.4 Comparison

There are very few femora across the three sites which display pathology. There is no statistically significant difference in pathological expression on the femora across the three sites (Chi Squared p=0.524). None of the femora derived from Lemba-*Lakkous* display any evidence of pathology. At Souskiou-*Laona*, only the adult femora display pathology, predominately in the form of osteoarthritic changes, while at Kissonerga-*Mosphilia*, one subadult skeleton exhibits bilateral expression of a possible metabolic disorder or infectious or hematopoietic disease. Thus comparison of pathologies of the femur across the sites is not possible, as different age groups are affected with different pathologies. The difference in pathological femora across the three sites is statistically significant when compared based on age group (Chi Squared p=0.992). Overall, none of the femora display evidence of congenital defect or infection and while there is possibly evidence of trauma, a radiograph is required to be certain. High levels of fragmentation and incomplete bones have made the assessment of femora across all three sites difficult.

3.2.21 Patella

Osteoarthritic change is the only type of pathology which was observed on the patellae. None of the patellae from Lemba-*Lakkous* or Kissonerga-*Mosphilia* display pathology. This does not represent a statistically significant difference in pathology on the patellae across the three sites (Chi Squared p=0.347). Table 3.258 presents the percentage of patellae derived from each site.

Table 3.258: Percentage of patellae from each site and percentage with pathology

Site	Count	Percent	Percent CBA for pathology	Count with OA	Percent with OA
Souskiou-*Laona*	81	75.0	18.5	6	7.4
Lemba-*Lakkous*	6	5.6	50.0	0	0.0
Kissonerga-*Mosphilia*	21	19.4	23.8	0	0.0

3.2.21.1 Souskiou-Laona

None of the subadult patellae from Souskiou-*Laona* display pathology (Table 3.259).While the indeterminate patellae display a slightly higher prevalence of pathology, there is no statistically significant difference in pathological expression on the patella based on side (Chi Squared p=0.866 – Table 3.260). Most of the patellae were recovered from commingled contexts and therefore do not have an assessed sex.

Table 3.259: Percentage of patellae with pathology by age group from Souskiou-*Laona*

Age	Count	Count of CBA for pathology	Count with OA	Percent with OA*
Subadult	2	1	0	0.0
Adult	79	14	6	9.2
Total	81	15	6	9.1

* Percentage does not include those that could not be assessed for pathology.

Table 3.260: Minimum number of patellae and percentage with pathology by side from Souskiou-*Laona*

Side	Count	Count with OA	Percent
Left	30	3	10.0
Right	29	2	6.9
Indeterminate	6	1	16.7

All six cases of pathology reflect osteoarthritic changes to the knee joint in the form of osteophytic growth, remodelling or porosity. A left and a right patella from Bonestack E Tomb 158 each display osteophytic growth on the posterior surface of the lateral articular facet. However, in both cases post-mortem damage makes the extent difficult to assess (Figure 3.155). A right patella from the Bonestack Tomb 200 displays a small patch of porosity (11x8mm) on the medial articular facet, while a left patella from the Bonestack Tomb 200 displays remodelling of the lateral facet with concavity of the articular surface and superior-lateral margin (Figure 3.156).The medial facet of the left patella from Skeleton A Tomb 192 displays remodelling of the articular surface with osteophytic growth along the margin of the facet (Figure 3.157). The unsided patella from Northwest Bonestack Tomb 161 displays large osteophytic growth (c.8mm) proximally directed on the anterior surface of the patella indicating ossification of the tendons and ligaments fixing the patella’s position (Figure 3.158). Osteophytic growth or remodelling of the articular facets indicates possible mal-articulation reflecting osteoarthritic changes. There is no evidence of trauma, infection, congenital defect, metabolic disorder or infectious or hematopoietic disease on any of the patellae.



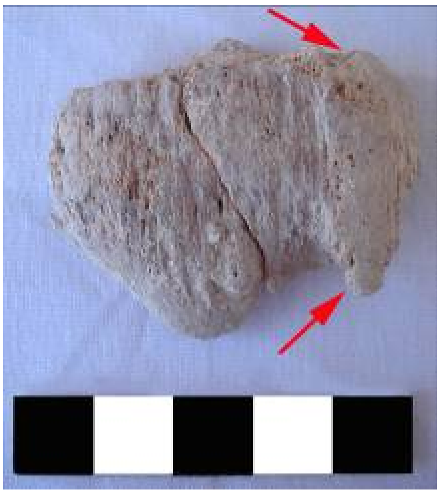



Figure 3.155: (Above left) Left patella from Tomb 158 Bonestack E with bone growth on the lateral condyle indicated (posterior view, superior aspect is up).

Figure 3.156: (Above centre) Left patella from Tomb 200 Bonestack with remodelling indicated on the lateral side (anterior view, superior is up).

Figure 3.157: (Above right) Left patella from Tomb 192 Skeleton A with mild osteophytic growth on the medial facet indicated (posterior view, superior is up).

Figure 3.158: (Left) Unsided patella from Tomb 161 Northwest Bonestack with a large bone growth on the anterior side indicated (anterior view, superior is up).

3.2.22 Tibia

3.2.22.1 Souskiou-Laona

Of the total tibiae examined, 61.8% are derived from Souskiou-*Laona*. Table 3.261 presents the percentage of tibial elements which were examined. Osteoarthritic changes and possible trauma are the only types of pathology observed on the tibiae at Souskiou-*Laona*. None of the subadult tibiae observed display any evidence of pathology (Table 3.262).

Table 3.261: Percentage of tibiae elements which were assessed from Souskiou-*Laona*

Assessment	**Count**	**Percent**
CBA	120	55.8
Pathology	2	0.9
No pathology	93	43.3
Totals	215	100.0

Table 3.262: Percentage of tibiae elements with pathology by age group from Souskiou-*Laona*

Age	**Count**	**Count with OA**	**Percent**	**Count with trauma**	**Percent**
Subadult	13	0	0.0	0	0.0
Adult	82	1	1.2	1	1.2
Total	95	1	1.1	1	1.1

In order to ensure there was no double counting of the same tibia in fragments within the same tomb, the minimum number of adult elements was tabulated and used to discuss prevalence[58]. Table 3.263 presents the minimum number of adult tibiae derived from Souskiou-*Laona* and the percentage with pathology, based on side. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.281). All of the tibiae with pathology are from bonestack contexts and none are provided with a sex determination.

Table 3.263: Minimum number of tibiae and percentage with pathology by side from Souskiou-*Laona*

Side	**Count**	**Count with pathology**	**Percent**
Left	37	2	5.4
Right	40	0	0.0

[58] The minimum number of elements was arrived at by cross-tabulating the side and the portion of the bone present and examining them by tomb context. This is to avoid double counting any bones. This does not include bones for which a side could not be determined as these were typically highly fragmentary making it difficult to determine the percentage of the bone present and how many discrete elements are present. This number is artificially low for the tibiae as they were so poorly preserved in general that the proximal and distal epiphyses were not often recovered and many are unsided diaphyses. 59.9% of the adult tibiae are less than 25% complete and 67.2% are very fragmentary or had no recognizable fragments.

The only osteoarthritic changes are observed on the proximal epiphysis of the tibiae. Table 3.264 presents the percentage of the proximal epiphyses observed with osteoarthritic change.

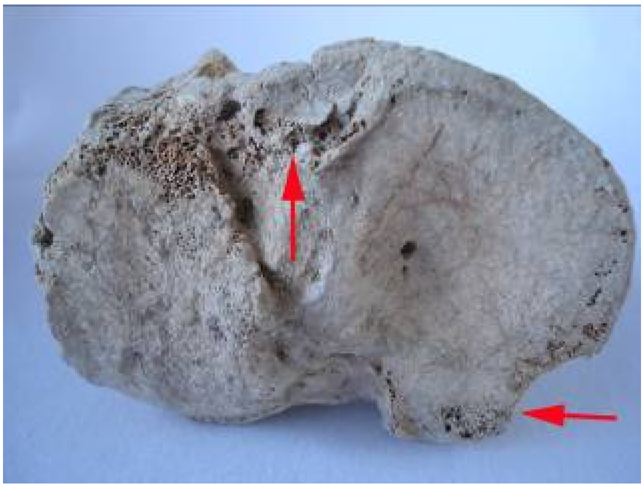
Table 3.264: Percentage of the proximal epiphyses with osteoarthritic changes from Souskiou-*Laona*

Bone Part	**Count Present**	**Count with OA**	**Percent**
Proximal epiphysis	26	1	3.8

A left tibia from the Bonestack Tomb 200 displays osteophytic growth on the lateral intercondylar tubercle and extension of the medial condyle of the proximal epiphysis with some porosity and bone growth on the posterior margin of the intercondylar fossa (Figure 3.159). A fragment of a left tibia from Bonestack B Tomb 220 is represented only by an ankylosed fragment of tibia and fibula most likely due to fracture. It is highly fragmentary and incomplete (Figure 3.160). There is no evidence of congenital defect, infection or metabolic disorder or infectious or hematopoietic disease on any of the tibiae at Souskiou-*Laona*.

Figure 3.159: (Below) Left tibia from Tomb 200 Bonestack with bone growth extending the medial condyle and porosity and bone growth in the interconylar fossa indicated (proximal view, anterior is up).

Figure 3.160: (Right) Left tibia from Tomb 220 Bonestack B with ankylosed fibula indicated, due to a healed fracture (anterior view, distal is down).



3.2.22.2 Lemba-Lakkous

Of the total tibiae examined, 15.2% are derived from Lemba-*Lakkous*. Table 3.265 presents the percentage of tibial elements which were examined. Evidence of a possible disease or disorder and possible trauma are the only pathology types observed on the tibiae at Lemba-*Lakkous*. None of the subadult tibiae observed display any evidence of pathology (Table 3.266).

Table 3.265: Percentage of tibial elements which were assessed from Lemba-*Lakkous*

Assessment	**Count**	**Percent**
CBA	18	34.0
Pathology	2	3.8
No pathology	33	62.2
Totals	53	100.0

Table 3.266: Percentage of tibial elements with pathology by age group from Lemba-*Lakkous*

Age	**Count**	**Count with disease**	**Percent**	**Count with trauma**	**Percent**
Subadult	23	0	0.0	0	0.0
Adult	12	1	8.3	1	8.3
Total	35	1	2.9	1	2.9

In order to ensure there was no double counting of the same tibia in fragments within the same tomb, the minimum number of adult elements was tabulated and used to discuss prevalence (see above footnote). Table 3.267 presents the minimum number of adult tibiae derived from Lemba-*Lakkous* and the percentage with pathology, based on side. This does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.794).

Table 3.267: Minimum number of tibiae and percentage with pathology by side from Lemba-*Lakkous*

Side	**Count**	**Count with pathology**	**Percent**
Left	7	1	14.3
Right	8	1	12.5

Both tibiae with pathology belong to females, therefore, 16.7% of the 12 female tibiae display pathology. There is no statistically significant difference in pathological expression on the tibiae based on sex (Chi Squared p=0.289). The right tibia from Grave 25 appears to bow laterally at the middle third of the diaphysis with some possible remodelled bone on the posterior margin of the proximal epiphysis, possibly representing a metabolic disorder or infectious or hematopoietic disease (Figure

3.161). The left tibia from Grave 50 displays a patch of woven bone on the medial aspect of the proximal third of the diaphysis possibly representing a blunt trauma incident which caused new bone growth (see Figure 3.34 above). There is no evidence of osteoarthritic changes, congenital defect or infection and no evidence of fracture.

Figure 3.161: (Left) Right tibia from Grave 25 with lateral bowing indicated by the arrow (posterior view, proximal is up).

3.2.22.3 Kissonerga-Mosphilia

Of the total tibiae examined, 23.0% are derived from Kissonerga-*Mosphilia*. Table 3.268 presents the percentage of tibial elements which were examined. None of the tibiae observed display any evidence of pathology. Table 3.269 presents the percentage of tibiae observed by age group.

Table 3.268: Percentage of tibial elements which were assessed from Kissonerga-*Mosphilia*

Assessment	**Count**	**Percent**
CBA	40	50.0
Pathology	0	0.0
No pathology	40	50.0
Totals	80	100.0

Table 3.269: Percentage of tibial elements with pathology by age group from Kissonerga-*Mosphilia*

Age	**Count**	**Percent**
Subadult	28	70.0
Adult	12	30.0

3.2.22.4 Comparison

When the subadult tibiae are removed from the calculations, there is statistically significant difference in pathological expression between Souskiou-*Laona* and Lemba-*Lakkous* and Lemba-*Lakkous* and Kissonerga-*Mosphilia*. Upon further analysis, there is no significant difference between Souskiou-*Laona* and Kissonerga-

Mosphilia[59]. The adult tibiae at Lemba-*Lakkous* display proportionally more pathology than the other two sites. None of the tibiae derived from Kissonerga-*Mosphilia* display any evidence of pathology. Overall, none of the tibiae display evidence of congenital defect or infection. High levels of fragmentation and incomplete bones have made the assessment of tibiae across all three sites difficult.

3.2.23 Fibulae

3.2.23.1 Souskiou-Laona

Of the total fibulae examined, 62.6% are derived from Souskiou-*Laona*. Table 3.270 presents the percentage of fibulae elements which were examined. Osteoarthritic changes and possible trauma are the only types of pathology observed on the fibulae from Souskiou-*Laona*. None of the subadult fibulae observed display any evidence of pathology (Table 3.271).

Table 3.270: Percentage of fibulae elements which were assessed from Souskiou-*Laona*

Assessment	**Count**	**Percent**
CBA	62	34.2
Pathology	3	1.7
No pathology	116	64.1
Totals	181	100.0

Table 3.271: Percentage of fibulae elements with pathology by age group from Souskiou-*Laona*

Age	**Count**	**Count with OA**	**Percent**	**Count with trauma**	**Percent**
Subadult	8	0	0.0	0	0.0
Adult	111	1	0.9	2	1.8
Total	119	1	0.8	2	1.7

In order to ensure there was no double counting of the same fibulae in fragments within the same tomb, the minimum number of adult elements was tabulated and used to discuss prevalence[60]. Table 3.272 presents the minimum number of adult fibulae derived from Souskiou-*Laona* and the percentage with pathology, based on side. This

[59] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.019, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.854 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.029.

[60] The minimum number of elements was arrived at by cross-tabulating the side and the portion of the bone present and examining them by tomb context. This is to avoid double counting any bones. This does not include bones for which a side could not be determined as these were typically highly fragmentary making it difficult to determine the percentage of the bone present and how many discrete elements are present. This number is artificially low for the fibulae as they were so poorly preserved in general that there are many are unsided diaphyses. 52.1% of the adult fibulae are less than 25% complete and 46.1% are very fragmentary or had no recognizable fragments.

does not represent a statistically significant difference in pathological expression based on side (Chi Squared p=0.209). All of the fibulae which display pathology are from bonestack contexts and none are provided with an assessment of sex.

Table 3.272: Minimum number of fibulae and percentage with pathology by side from Souskiou-*Laona*

Side	Count	Count with pathology	Percent
Left	34	2	5.9
Right	34	1	2.9

The only case of osteoarthritic change is observed on the distal epiphysis of the fibula. Table 3.273 presents the percentage of the distal epiphyses observed with osteoarthritic change.

Table 3.273: Percentage of the distal epiphyses with osteoarthritic changes from Souskiou-*Laona*

Bone Part	Count Present	Count with OA	Percent
Distal epiphysis	49	1	2.0

A left fibula from North Bonestack Tomb 165 displays mild osteophytic growth on the posterior margin of the medial facet of the distal epiphysis (Figure 3.162). A right fibula from Bonestack Tomb 200 displays significant bone remodelling and porosity superior to the distal epiphysis with osteophytic growth at the margin of the distal-medial articular facet (Figure 3.163). Finally, the second case of trauma is associated with the tibia described above from Bonestack B Tomb 220, where a fragment of fibula is ankylosed to the tibia, likely due to a fracture (see Figure 3.160 above). Both fibulae with evidence of trauma are highly fragmentary and incomplete.

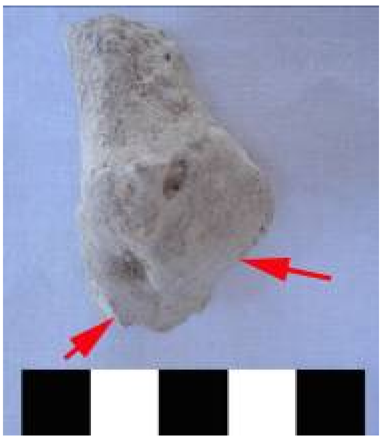


Figure 3.162: (Left) Left fibula from Tomb 165 North Bonestack with mild osteophytic growth indicated on the margin of the medial articular facet (medial view, proximal is up).

Figure 3.163: (Right) Right fibula from Tomb 200 Bonestack with porous bone growth and remodelling indicated with the arrows (medial view, proximal is up).

3.2.23.2 Lemba-Lakkous

Of the total fibulae examined, 13.5% are derived from Lemba-*Lakkous*. Table 3.274 presents the percentage of fibulae elements which were examined. None of the fibulae observed from Lemba-*Lakkous* display any evidence of pathology. Table 3.275 provides the percentage of fibulae by age group.

Table 3.274: Percentage of fibulae elements which were assessed from Lemba-*Lakkous*

Assessment	**Count**	**Percent**
CBA	9	23.1
Pathology	0	0.0
No pathology	30	76.9
Totals	39	100.0

Table 3.275: Percentage of fibulae by age group from Lemba-*Lakkous*

Age	**Count**	**Percent**
Subadult	18	60.0
Adult	12	40.0
Total	30	100.0

3.2.23.3 Kissonerga-Mosphilia

Of the total fibulae examined, 23.9% are derived from Kissonerga-*Mosphilia*. Table 3.276 presents the percentage of fibulae elements which were examined. None of the fibulae observed from Kissonerga-*Mosphilia* display any evidence of pathology. Table 3.277 provides the percentage of fibulae by age group.

Table 3.276: Percentage of fibulae elements which were assessed from Kissonerga-*Mosphilia*

Assessment	**Count**	**Percent**
CBA	25	36.2
Pathology	0	0.0
No pathology	44	63.8
Totals	69	100.0

Table 3.277: Percentage of fibulae by age group from Kissonerga-*Mosphilia*

Age	**Count**	**Percent**
Subadult	33	75.0
Adult	11	25.0
Total	44	100.0

3.2.23.4 Comparison

There is no statistically significant difference in pathological expression on the fibulae across the three sites (Chi Squared p=0.405). Only adult fibulae from Souskiou-*Laona* display pathology. There is no evidence of congenital defect or metabolic or infectious or hematopoietic disease. Overall, assessment for pathologies of the fibulae was hindered by the poor preservation as most of the fibulae examined were highly fragmentary and incomplete.

3.2.24 Tarsals

Overall, 19.0% (n=700) of the expected number of tarsals were recovered as each complete skeleton should have 14 tarsals and there are a minimum of 263 individuals across the three sites.

3.2.24.1 Souskiou-Laona

Of the total tarsal sample examined, 75.9% is derived from Souskiou-*Laona*. All the pathologies observed on the tarsals at Souskiou-*Laona* reflect osteoarthritic changes in the form of osteophytic growth, remodelling of the bone or porosity. None of the subadult tarsals examined display evidence of pathology (Table 3.278).

Table 3.278: Percentage of tarsals with pathology by age group from Souskiou-*Laona*

Age	Count	Count with OA	Percent	CBA for pathology	Percent
Subadult	19	0	0.0	1	5.3
Adult	512	22	4.3	109	21.3
Total	531	22	4.1	110	20.7

Table 3.279 presents the percentage of pathology observed on each adult tarsal derived from Souskiou-*Laona*[61]. The intermediate cuneiforms and cuboids do not display any evidence of pathology.

Table 3.279: Number of each tarsal and percentage with osteoarthritic changes from Souskiou-*Laona*

Tarsal			Indeterminate	Left	Right	Total
Talus	No pathology	Count	4	34	41	79
	OA observed	Count	0	3	4	7
	Total	Count	4	37	45	86
	Percent with OA		0.0	8.1	8.9	8.1
Calcaneus	No pathology	Count	4	33	34	67
	OA observed	Count	0	1	1	2
	Total	Count	4	34	35	69
	Percent with OA		0	2.9	2.9	2.9

[61] Note that this does not include the 19 subadult tarsals identified or the 109 adult tarsals which could not be assessed for pathology.

Tarsal			Indeterminate	Left	Right	Total
Navicular	No pathology	Count	7	25	27	59
	OA observed	Count	0	7	4	11
	Total	Count	7	32	31	70
	Percent with OA		0.0	21.9	12.9	15.7
Medial cuneiform	No pathology	Count	0	21	24	45
	OA observed	Count	0	0	1	1
	Total	Count	0	21	25	46
	Percent with OA		0.0	0.0	4.0	2.2
Intermediate cuneiform	No pathology	Count	1	19	19	39
	OA observed	Count	0	0	0	0
	Total	Count	1	19	19	39
	Percent with OA		0.0	0.0	0.0	0.0
Lateral cuneiform	No pathology	Count	0	14	17	31
	OA observed	Count	0	1	0	1
	Total	Count	0	15	17	32
	Percent with OA		0.0	6.7	0.0	3.1
Cuboid	No pathology	Count	2	24	24	50
	OA observed	Count	0	0	0	0
	Total	Count	2	24	24	50
	Percent with OA		0.0	0.0	0.0	0.0
Indet tarsal	No pathology	Count	5	1	1	7
	OA observed	Count	0	0	0	0
	Total	Count	5	1	1	7
	Percent with OA		0.0	0.0	0.0	0.0

There are a minimum of 45 discrete adult skeletons represented within the tarsal sample based on the right talus. There is no statistically significant difference in pathological expression on the tarsals based on side (Chi Squared p=0.404). It is not possible to discuss the differences in pathological expression based on sex as very few of the tarsals from Souskiou-*Laona* are associated with an articulated skeleton. There are however, statistically significant differences in pathological expression between several of the tarsal groups. When the frequency of pathology affecting different tarsals was compared, a statistically significant difference was calculated (p=0.001). When this is examined further using the post-hoc tests, the navicular displays significantly more pathology than the calcaneus, medial cuneiform, intermediate cuneiform and cuboid[62]. There is no statistically significant difference in pathological expression amongst any of the other tarsal groups.

[62] Navicular-Calcaneus - Oneway ANOVA Tukey HSD p=0.007, Navicular-Medial Cuneiform - Oneway ANOVA Tukey HSD p=0.039, Navicular-Intermediate Cuneiform - Oneway ANOVA Tukey HSD p=0.015 and Navicular-Cuboid - Oneway ANOVA Tukey HSD p=0.005.

In general, the navicular displays the highest frequency of pathological expression of all the tarsals at Souskiou-*Laona*, with the left navicular displaying the highest frequency of pathology when side is included. In three cases the navicular tubercle is remodelled to less prominently protrude from the body of the navicular. Remodelling of the tubercle occurs in a similar manner on two left naviculars from Bonestack E Tomb 158 and a right navicular from Bonestack B Tomb 220 (Figure 3.164). The distal facet of the navicular displays osteophytic growth on the lateral margin of the articular surface in two cases: a right navicular from Bonestack Tomb 160 and a left navicular from Bonestack Tomb 192 (Figure 3.165). The dorsal-lateral margin of the proximal facet of the navicular displays mild osteophytic growth in four cases: a left and a right navicular from Bonestack Tomb 200, a left navicular from Bonestack Tomb 228 and a left navicular from commingled Tomb 228 (Figure 3.166). A right navicular from Bonestack Tomb 200 displays rough bone growth and extension of the dorsal and lateral surfaces to the tubercle (Figure 3.167). Finally, a left navicular from Bonestack Tomb 189 displays bone growth along the dorsal aspect with mild osteophytic growth along the dorsal margins of the proximal and distal facets. It is unclear how much the bone growth would have affected the individuals and in general, the bone growth on the articular facets was rather minimal.




Figure 3.164: (Above left) Left navicular from Tomb 158 Bonestack E with remodelling of the tubercle indicated (proximal view, dorsal is up).
Figure 3.165: (Above centre) Left navicular from Tomb 192 Bonestack with mild osteophytic growth on the margins of the distal articular surface as indicated (distal view, dorsal is up).
Figure 3.166: (Above right) Left navicular from Tomb 228 commingled material with bone growth on the proximal articular surface dorsal-lateral margin (proximal view, dorsal is up).
Figure 3.167: (Left) Right navicular from Tomb 200 Bonestack with bone growth on the dorsal surface and distal aspect indicated (dorsal view, proximal is up, tubercle is to the left).

The tali display the second highest frequency of pathology. Two tali, a left talus from Bonestack Tomb 192 and a right talus from Bonestack D Tomb 192 exhibit changes in morphology to make the bone appear flattened with osteophytic growth on several articular facets, including extension of the superior facet (Figure 3.168). Three tali; a left talus from the Bonestack Tomb 200, a right talus from Bonestack Tomb 192 and a right talus from Bonestack C Tomb 165, display bone growth extending the inferior calcaneal articular facet towards the posterior (Figure 3.169). A right talus from Bonestack B Tomb 220 displays osteophytic growth along the inferior calcaneal articular facet as well as mild osteophytic growth on the superior-medial margins of the trochlea. Finally, a left talus from commingled context Tomb 208 displays osteophytic growth on the superior-medial margins of the trochlea and head of the talus, however poor preservation makes it difficult to assess the extent (Figure 3.170). As with the navicular, the osteophytic growth at the margins of the articular facets of the tali is rather mild and the general impact on the individual would most likely have been minor.

Figure 3.168: (Above left) Left talus from Tomb 192 Bonestack with a general flattened morphology and mild bone growth on the trochlea neck and medial malleolar surface (superior-medial view, superior is up).

Figure 3.169: (Above right) Left talus from Tomb 200 with bone growth on the trochlea neck and extended medial malleolar surface (superior-medial view, superior is up).

Figure 3.170: (Left) Left talus from Tomb 208 with osteophytic growth on the superior articular surfaces (superior view, distal is up).

The right calcaneus from Skeleton A Tomb 201display a large pit along the plantar side of the body with some growth on the posterior suruface with some remodelling of the plantar margin of the anterior facet (Figure 3.171). The superior facets of a left calcaneus fragment from North Bonestack Tomb 165 displays mild osteophytic growth along the posterior aspect of the facet. A right medial cuneiform from the Bonestack Tomb 200 displays very mild osteophytic growth on the dorsal-lateral aspect (Figure 3.172). A left lateral cuneiform from the Bonestack Tomb 189 displays new bone porous growth along the dorsal aspect (Figure 3.173). There is no evidence of trauma, congenital defect, infection, metabolic disorder or infectious or hematopoietic disease on any of the tarsals.

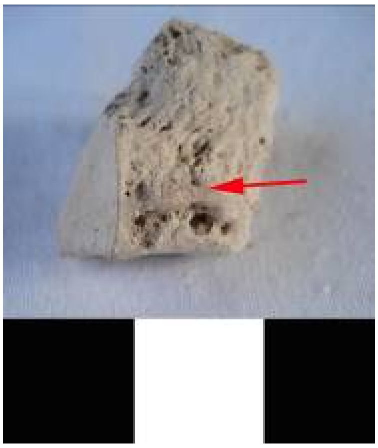


Figure 3.171: (Above left) Right calcaneus from Tomb 201 Skeleton A with remodelled bone on the plantar surface, as indicated, creating a pit (plantar view, medial aspect is down).

Figure 3.172: (Above right) Right medial cuneiform from Tomb 200 Bonestack with bone growth altering the articular surface, as indicated, and an osteophyte in the dorsal-lateral aspect (view from the intermediate cuneiform, dorsal is up)

Figure 3.173: (Left) Left lateral cuneiform from Tomb 189 Bonestack with porous new bone growth on the dorsal aspect, as indicated (dorsal view, plantar is up).

3.2.24.2 Lemba-Lakkous

Of the total tarsal sample examined, 7.4% is derived from Lemba-*Lakkous*. None of the tarsals examined display evidence of pathology. Table 3.280 presents the percentage of each age group observed. Table 3.381 presents the percentage of each adult tarsal derived from Lemba-*Lakkous* by side[63]. There are a minimum of three discrete adult skeletons represented within the tarsal sample based on the left and right talus, left and right calcaneus and left and right navicular.

Table 3.280: Percentage of tarsals with pathology by age group from Lemba-*Lakkous*

Age	**Count**	**Percent**	**CBA for pathology**	**Percent**
Subadult	15	28.8	8	53.3
Adult	37	71.2	9	24.3
Total	52	100.0	17	32.7

Table 3.381: Number of each tarsal and percentage with osteoarthritic changes from Lemba-*Lakkous*

Tarsals			**Indeterminate**	**Left**	**Right**	**Total**
Talus	No pathology	Count	0	3	3	6
	Pathology	Count	0	0	0	0
	Total	Count	0	3	3	6
Calcaneus	No pathology	Count	0	2	2	4
	Pathology	Count	0	0	0	0
	Total	Count	0	2	2	4
Navicular	No pathology	Count	0	3	3	6
	Pathology	Count	0	0	0	0
	Total	Count	0	3	3	6
Medial cuneiform	No pathology	Count	0	0	2	2
	Pathology	Count	0	0	0	0
	Total	Count	0	0	2	2
Intermediate cuneiform	No pathology	Count	0	2	3	5
	Pathology	Count	0	0	0	0
	Total	Count	0	2	3	5
Lateral cuneiform	No pathology	Count	0	1	1	2
	Pathology	Count	0	0	0	0
	Total	Count	0	1	1	2
Cuboid	No pathology	Count	0	2	0	2
	Pathology	Count	0	0	0	0
	Total	Count	0	2	0	2
Indet tarsal	No pathology	Count	1	0	0	1
	Pathology	Count	0	0	0	0
	Total	Count	1	0	0	1

[63] Note that this does not include the 15 subadult tarsals identified or the nine adult tarsals which could not be assessed for pathology.

3.2.24.3 Kissonerga-Mosphilia

Of the total tarsal sample examined, 16.7% is derived from Kissonerga-*Mosphilia*. Osteoarthritic change is the only type of pathology observed on the tarsals from Kissonerga-*Mosphilia*. None of the subadult tarsals examined display evidence of pathology (Table 3.282).

Table 3.282: Percentage of tarsals with pathology by age group from Kissonerga-*Mosphilia*

Age	Count	Percent	Count with OA	Percent	CBA for pathology	Percent
Subadult	53	45.3	0	0.0	12	22.6
Adult	64	54.7	1	1.6	18	28.1
Total	117	100.0	1	0.9	30	25.6

Table 3.383 presents the percentage of pathology observed on each adult tarsal derived from Kissonerga-*Mosphilia*[64]. The navicular is the only tarsal which displays any evidence of pathology. There is no statistically significant difference in pathological expression on the tarsals based on side (Chi Squared p=0.562).

Table 3.383: Number of each tarsal and percentage with osteoarthritic changes from Kissonerga-*Mosphilia*

Tarsals			Indeterminate	Left	Right	Total
Talus	No pathology	Count	1	5	2	8
	OA observed	Count	0	0	0	0
	Total	Count	1	5	2	8
Calcaneus	No pathology	Count	0	5	4	9
	OA observed	Count	0	0	0	0
	Total	Count	0	5	4	9
Navicular	No pathology	Count	2	3	3	8
	OA observed	Count	0	0	1	1
	Total	Count	2	3	4	9
	Percent of OA		0.0	0.0	25.0	11.1
Medial cuneiform	No pathology	Count	0	3	1	4
	OA observed	Count	0	0	0	0
	Total	Count	0	3	1	4
Intermediate cuneiform	No pathology	Count	0	0	5	5
	OA observed	Count	0	0	0	0
	Total	Count	0	0	5	5
Lateral cuneiform	No pathology	Count	0	2	4	6
	OA observed	Count	0	0	0	0
	Total	Count	0	2	4	6
Cuboid	No pathology	Count	0	2	3	5
	OA observed	Count	0	0	0	0
	Total	Count	0	2	3	5

[64] Note that this does not include the 53 subadult tarsals identified or the 18 adult tarsals which could not be assessed for pathology.

There are a minimum of five discrete adult skeletons represented within the tarsal sample based on the left talus, left calcaneus and right intermediate cuneiform. A right navicular from Grave 526 exhibits osteoarthritic changes in the form of remodelling, particularly around the tubercle where it appears that a new facet has formed (Figure 3.174). There is no evidence of trauma, infection, congenital defect, metabolic disorder or infectious or hematopoietic disease on any of the tarsals from Kissonerga-*Mosphilia*.

Figure 3.174: Right navicular from Grave 526 with remodelling of the proximal articular surface as indicated (proximal view, dorsal-medial aspect is up).

<u>3.2.24.4 Comparison</u>

Overall, there is no statistically significant difference in pathological expression on the adult tarsals across the three sites (Chi Squared p=0.281). In general, the osteoarthritic changes affecting the tarsals at all three sites are rather minor and it is unclear how much of an impact on the individual these pathologies would have had on the use of the ankle. There is no statistically significant difference in pathological expression across the three sites based on side or sex (Chi Squared p=0.149 and p=0.186). There is no statistically significant difference in pathological expression amongst sites in regards to each tarsal type (Table 3.280). There is no evidence of trauma, infection, congenital defects, metabolic disorders or infectious or hematopoietic disease at any of the sites.

Table 3.284: Statistical significance of pathologies observed on the tarsals across all three sites

Tarsal	**Chi Squared**
Talus	p=0.564
Calcaneus	p=0.823
Navicular	p=0.656
Medial Cuneiform	p=0.925
Intermediate Cuneiform	CBA
Lateral Cuneiform	p=0.855
Cuboid	CBA

3.2.25 Metatarsals

3.2.25.1 Souskiou-Laona

Of the total metatarsal sample examined, 68.5% is derived from Souskiou-*Laona*. The pathologies affecting the metatarsals at Souskiou-*Laona* reflect either osteoarthritic changes or trauma. None of the subadult metatarsals examined display any evidence of pathology (Table 3.285).

Table 3.285: Percentage of metatarsals with pathology by age group from Souskiou-*Laona*

Age	Count	Count with OA	Percent	Count with trauma	Percent	CBA for pathology	Percent
Subadult	19	0	0.0	0	0.0	1	5.3
Adult	630	13	2.1	10	1.6	118	18.7
Total	649	13	2.0	10	1.5	119	18.3

Table 3.286 presents the percentage of pathology observed on each adult metatarsal ray derived from Souskiou-*Laona*[65]. The greatest percentage of metatarsals recovered from Souskiou-*Laona* could not be identified in regards to ray or side due to taphonomic damage. There is no statistically significant difference in pathological expression amongst the five metatarsal groups (Chi Squared p=0.844)[66]. There are a minimum of 50 discrete adult skeletons represented within the metatarsal sample based on the right first metatarsal.

Table 3.286: Number of each metatarsal examined and percentage with pathology from Souskiou-*Laona*

Metatarsals			Indeterminate	Left	Right	Total
MT I	No pathology	Count	2	33	46	81
	OA observed	Count	0	1	3	3
		Percent	0.0	2.9	6.0	3.4
	Trauma observed	Count	0	1	1	3
		Percent	0.0	2.9	2.0	3.4
	Total	Count	2	35	50	87
MT II	No pathology	Count	0	35	33	68
	OA observed	Count	0	1	1	2
		Percent	0.0	2.7	2.9	2.8
	Trauma observed	Count	0	1	0	1
		Percent	0.0	2.7	0.0	1.4
	Total	Count	0	37	34	71

[65] Note that this does not include the 19 subadult metatarsals identified or the 118 adult metatarsals which could not be assessed for pathology.

[66] When the indeterminate metatarsals are included, there is a significant difference, however as these are not identified it is not best practice to include them in the analysis.

Metatarsals			Indeterminate	Left	Right	Total
MT III	No pathology	Count	0	34	31	65
	OA observed	Count	0	0	1	1
		Percent	0.0	0.0	3.1	1.5
	Trauma observed	Count	0	2	0	2
		Percent	0.0	5.6	0.0	2.9
	Total	Count	0	36	32	68
MT IV	No pathology	Count	2	37	41	80
	OA observed	Count	0	0	2	2
		Percent	0.0	0.0	4.7	2.4
	Trauma observed	Count	0	2	0	2
		Percent	0.0	5.1	0.0	2.4
	Total	Count	2	39	43	84
MT V	No pathology	Count	1	36	45	82
	OA observed	Count	0	1	3	4
		Percent	0.0	2.6	6.1	4.5
	Trauma observed	Count	0	2	1	3
		Percent	0.0	5.1	2.0	3.4
	Total	Count	1	39	49	89
Indet MT	No pathology	Count	103	6	4	113
	OA observed	Count	0	0	0	0
		Percent	0.0	0.0	0.0	0.0
	Trauma observed	Count	0	0	0	0
		Percent	0.0	0.0	0.0	0.0
	Total	Count	103	6	4	113

The trauma observed on the metatarsals reflects either a minor incident which has caused a small bony callous or osteophyte on the diaphysis of the metatarsal (seven cases) or a more severe fracture and the formation of a significant bone callous (four cases). Two first metatarsals display mild reactions to trauma: a left first metatarsal from commingled context quadrant II Tomb 125 displays a 1x1mm osteophyte on the medial surface of the diaphysis; and a right first metatarsal from Bonestack B Tomb 220 has a small osteophyte on the dorsal-medial surface, in the distal third of the diaphysis. A left third metatarsal from Northwest Bonestack Tomb 161 displays a small osteophyte (c.1-2mm) on the dorsal aspect of the diaphysis projecting superiorly (Figure 3.175). A left fourth metatarsal from the Northwest Bonestack Tomb 161 exhibits an 11.1mm osteophyte on the dorsal surface of the middle of the diaphysis projecting distally (Figure 3.176). A right fifth metatarsal from the Bonestack Tomb 160 displays a small (4mm) osteophyte on the lateral aspect of the diaphysis (Figure 3.177). A left fifth metatarsal from Bonestack B Tomb 220 displays a small patch of rough bone on the plantar aspect of the diaphysis.

Figure 3.175: (Below left) Left third metatarsal from Tomb 161 Northwest Bonestack with a small osteophyte on the dorsal surface indicated (dorsal view, proximal is up).

Figure 3.176: (Below right-top) Left fourth metatarsal from Tomb 161 Northwest Bonestack with osteophyte on the dorsal surface indicated (plantar view, proximal is right, distal is up).

Figure 3.177: (Below right-bottom) Right fifth metatarsal from Tomb 160 Bonestack with small osteophytes on the lateral aspect indicated (lateral view, proximal is right).

Interestingly, all four of the metatarsals which exhibit healed fractures are from the left side, from two different burial contexts. A left second metatarsal from commingled context Tomb 228 displays significant bone growth on the lateral surface of the distal third of the diaphysis, which would have certainly impacted the third metatarsal and most likely reflects a healed fracture (Figure 3.178). A left third metatarsal from the Bonestack Tomb 228 displays significant bone growth on the lateral aspect with remodelling of the distal third of the diaphysis (Figure 3.179). A left fourth metatarsal from the Bonestack Tomb 228 once again exhibits significant remodelling with thickening of the distal third of the diaphysis and osteophytic growth along the margins of the articular surface of the proximal epiphysis (Figure 3.180). Finally, a left fifth metatarsal from the Bonestack Tomb 200 displays significant mal-articulation of a broken diaphysis. The distal half of the metatarsal is fused to the dorsal aspect of the proximal half of the metatarsal with a large bone callous (Figure 3.181). It is possible that all those metatarsals from Tomb 228 are from the same individual as they were all recovered from the commingled contexts and could possibly articulate though the pathology makes articulation awkward.

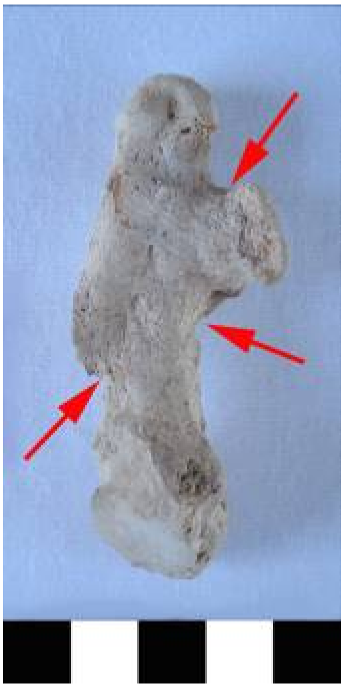


Figure 3.178: (Above left) Left second metatarsal from Tomb 228 commingled with bone growth on lateral surface of distal third of the diaphysis indicated (plantar view, distal is up).

Figure 3.179: (Above centre) Left third metatarsal from Tomb 228 Bonestack with bone growth on the lateral aspect of the distal third of the diaphysis indicated (dorsal view, distal is up).

Figure 3.180: (Above right) Left fourth metatarsal from Tomb 228 Bonestack with bone growth and remodelling of the distal third of the diaphysis and proximal epiphysis indicated (lateral view, distal is up).

Figure 3.181: (Left) Left fifth metatarsal from Tomb 200 Bonestack with mal-fusion of a fracture is indicated with the distal half overlapping with the proximal half and bone growth indicated (medial view, distal is up).

The osteoarthritic changes involve osteophytic growth and remodelling of the epiphyses (12 cases). The distal epiphysis is affected in four cases. The left first metatarsal from Skeleton C Tomb 200 exhibits a small (c.2.5mm) patch of bone growth on the dorsal-lateral aspect of the diaphysis just posterior of the distal epiphysis most likely due to mal-articulation with the proximal first foot phalanx (Figure 3.182). A right first metatarsal from Bonestack Tomb 192 displays mild extension of the distal epiphysis towards the posterior, on the medial aspect of the dorsal surface. A right first metatarsal from the North Bonestack Tomb 165 exhibits mild extension of the lateral facet, plantar aspect of the distal epiphysis. A right fifth metatarsal from Bonestack E Tomb 158 displays a small (c.2mm) osteophyte on the medial tuberosity of the distal epiphysis.

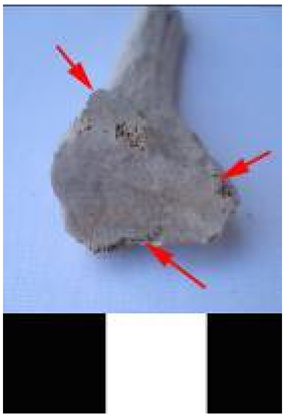




Figure 3.182: (Above left) Left first metatarsal from Tomb 200 Skeleton C with bone growth along the margin and just proximal of the distal epiphysis indicated (dorsal view, distal is up).

Figure 3.183: (Above centre left) Left second metatarsal from Tomb 132 commingled with very mild osteophytic growth along margins of the proximal and lateral articular surfaces (proximal view, lateral is up).

Figure 3.184: (Above centre right) Right fourth metatarsal from Tomb 201 Skeleton A with mild osteophytic growth along the margins of the proximal epiphysis indicated (medial view, distal is up).

Figure 3.185: (Above right) Right fifth metatarsal from Tomb 200 Bonestack with osteophytic growth distally directed indicated (dorsal view, distal is up).

Figure 3.186: (Left) Left fifth metatarsal from Tomb 200 Bonestack with remodelled and porous styloid process indicated (lateral view, distal

The proximal epiphysis of the metatarsals displays osteoarthritic changes in nine cases. A right first metatarsal from the commingled context Tomb 168 displays remodelled rough bone growth on the lateral aspect of the proximal epiphysis, roughly round in shape, it possibly reflects a mal-articulation with the second metatarsal. A left second metatarsal from the commingled context Tomb 132 exhibits very mild bone growth distally directed of the proximal lateral articular facet and osteophytic growth along the margin of the proximal epiphysis (Figure 3.183). A right second metatarsal from Bonestack A Tomb 220 displays distally directed c.3mm extension of the lateral facet of the proximal epiphysis, reflecting a mal-articulation with the third right metatarsal. A right third metatarsal from Bonestack D Tomb 192 displays mild extension of the proximal lateral facet towards the plantar aspect. A right fourth metatarsal from Skeleton A Tomb 201 displays slight osteophytic growth along the margins of the proximal facet (Figure 3.184). Another right fourth metatarsal from North Bonestack Tomb 165 exhibits extension of the proximal epiphysis towards the plantar aspect. A right fifth metatarsal from the Bonestack Tomb 200 displays osteophytic growth on the styloid process and distally directed extension of the medial facet (Figure 3.185). A right fifth metatarsal from the commingled context Tomb 132 displays mild osteophytic growth (c.1mm) at the margins of the medial facet distally directed. A left fifth metatarsal from the Bonestack Tomb 200 displays remodelling of the styloid process which is concave on the lateral side with porous bone which was likely still forming at the time of death (Figure 3.186).

Table 3.287 presents the percentage of proximal and distal epiphyses displaying pathology for each metatarsal ray. Interestingly, the recovery of the distal epiphysis is much poorer than the proximal epiphysis. The poor recovery likely contributes to the limited expression of osteoarthritic changes to the distal epiphysis.

Table 3.287: Percentage of proximal and distal epiphyses with pathology for each metatarsal ray from Souskiou-*Laona*

Metatarsal	**Proximal Epiphyses**	**PE with pathology**	**Percent**	**Distal Epiphyses**	**DE with pathology**	**Percent**
MT I	49	1	2.0	49	3	6.1
MT II	54	2	3.7	24	0	0.0
MT III	52	1	1.9	23	0	0.0
MT IV	58	2	3.4	24	0	0.0
MT V	71	3	4.2	26	1	3.8
Indet MT	3	0	0.0	11	0	0.0

None of the metatarsals display significant differences in pathological expression based on side. Table 3.288 presents the statistical analysis of the differences in pathological expression based on side for each metatarsal ray. In general, as most of the metatarsals were recovered from the bonestack material it is not possible to provide them with an assessed sex.

Table 3.288: Significance analysis of pathological expression based on side from Souskiou-*Laona*

Metatarsal	**Side – Chi Squared**
MT I	p=0.742
MT II	p=0.556
MT III	p=0.624
MT IV	p=0.955
MT V	p=0.842
Indet MT	N/A

While the greatest proportion of metatarsals observed at Souskiou-*Laona* are unidentified in regards to ray number and side due to taphonomic damage, none display pathology. This is most likely due to the fact that most are missing their epiphyses and have only partial diaphyses present. Overall, there is no evidence of infection, congenital defects, metabolic disorders or infectious or hematopoietic diseases on any of the metatarsals.

<u>3.2.25.2 Lemba-Lakkous</u>

Of the total metatarsal sample examined, 11.1% is derived from Lemba-*Lakkous*. There was no pathology observed on any of the metatarsals derived from Lemba-*Lakkous*. Table 3.289 presents the percentage of metatarsals from each age group.

Table 3.289: Percentage of metatarsals with pathology by age group from Lemba-*Lakkous*

Age	**Count**	**Percent**	**CBA for pathology**	**Percent**
Subadult	42	40.0	3	7.1
Adult	52	49.5	10	19.2
CBA	11	10.5	11	100.0
Total	105	100.0	24	22.9

Table 3.290 presents the percentage of each adult metatarsal ray derived from Lemba-*Lakkous*[67]. There are a minimum of six discrete adult skeletons represented within the metatarsal sample based on the right first metatarsals.

Table 3.290: Number of each metatarsal examined and percentage with pathology from Lemba-*Lakkous*

Metatarsals			**Indeterminate**	**Left**	**Right**	**Total**
MT I	No pathology	Count	0	2	6	8
	Pathology observed	Count	0	0	0	0
	Total	Count	0	2	6	8
MT II	No pathology	Count	0	2	2	4
	Pathology observed	Count	0	0	0	0
	Total	Count	0	2	2	4
MT III	No pathology	Count	0	3	2	5
	Pathology observed	Count	0	0	0	0
	Total	Count	0	3	2	5

[67] Note that this does not include the 42 subadult metatarsals identified, the eleven metatarsal which could not be provided with an age estimation or the 10 adult metatarsals which could not be assessed for pathology.

Metatarsals			Indeterminate	Left	Right	Total
MT IV	No pathology	Count	0	3	2	5
	Pathology observed	Count	0	0	0	0
	Total	Count	0	3	2	5
MT V	No pathology	Count	0	3	2	5
	Pathology observed	Count	0	0	0	0
	Total	Count	0	3	2	5
Indet MT	No pathology	Count	7	4	4	15
	Pathology observed	Count	0	0	0	0
	Total	Count	7	4	4	15

Poor preservation and recovery and the lack of epiphyses may have contributed to the lack of pathologies observed on the metatarsals at Lemba-*Lakkous*. Overall, only 21 proximal and 12 distal epiphyses survive, meaning that 36.5% do not have either epiphysis present, which will directly impact the ability to observe osteoarthritic changes to the metatarsals from Lemba-*Lakkous*.

3.2.25.3 Kissonerga-Mosphilia

Of the total metatarsal sample examined, 20.4% is derived from Kissonerga-*Mosphilia*. The pathologies observed on the metatarsals at Kissonerga-*Mosphilia* reflect osteoarthritic changes. None of the subadult metatarsals examined display any evidence of pathology (Table 3.291).

Table 3.291: Percentage of metatarsals with pathology by age group from Kissonerga-*Mosphilia*

Age	Count	Count with OA	Percent	CBA for pathology	Percent
Subadult	116	0	0.0	12	10.3
Adult	77	4	5.2	23	29.9
Total	193	4	2.1	35	18.1

Table 3.292 presents the percentage of pathology observed on each adult metatarsal ray derived from Kissonerga-*Mosphilia*[68]. There are a minimum of eight discrete adult skeletons represented within the metatarsal sample based on the right second metatarsals. Only the first and fifth metatarsals display evidence of pathology.

[68] Note that this does not include the 116 subadult metatarsals identified or the 23 adult metatarsals which could not be assessed for pathology.

Table 3.292: Number of each metatarsal examined and percentage with pathology from Kissonerga-*Mosphilia*

Metatarsals			**Indeterminate**	**Left**	**Right**	**Total**
MT I	No pathology	Count	1	4	3	8
	OA observed	Count	0	1	1	2
		Percent	0.0	20.0	25.0	20.0
	Total	Count	1	5	4	10
MT II	No pathology	Count	0	5	8	13
	OA observed	Count	0	0	0	0
	Total	Count	0	5	8	13
MT III	No pathology	Count	0	4	7	11
	OA observed	Count	0	0	0	0
	Total	Count	0	4	7	11
MT IV	No pathology	Count	0	6	3	9
	OA observed	Count	0	0	0	0
	Total	Count	0	6	3	9
MT V	No pathology	Count	1	4	3	8
	OA observed	Count	0	1	1	2
		Percent	0.0	20.0	24.0	20.0
	Total	Count	1	5	4	10
Indet MT	No pathology	Count	1	0	0	1
	OA observed	Count	0	0	0	0
	Total	Count	1	0	0	1

The right first metatarsal from Skeleton 1 Grave 526 displays very mild bone extension of the lateral facet, lateral aspect of the distal epiphysis (Figure 3.187). The left first metatarsal from Skeleton A Grave 505 displays proximal-lateral bone extension of the lateral condyle on the plantar side and osteophytic growth on the dorsal surface, lateral aspect (see Figure 3.47 above). The left and right fifth metatarsals from the individual within Grave 561 both display mild osteophytic growth along the margins of the medial facet of the proximal epiphysis (Figure 3.188).

Figure 3.187: (Left)
Right first metatarsal from Grave 526 Skeleton 1 with very mild bone growth on the lateral facet indicated (lateral view, distal is up).

Figure 3.188: (Right)
Left fifth metatarsal from Grave 505 Skeleton A with mild bone growth on the medial articular surface indicated (medial view, distal is up).

Table 3.293 presents the percentage of proximal and distal epiphyses displaying pathology for each metatarsal ray. The poor recovery of the epiphyses in general from Kissonerga-*Mosphilia* likely contributes to the limited expression of osteoarthritic changes.

Table 3.293: Percentage of proximal and distal epiphyses with pathology for each metatarsal ray from Kissonerga-*Mosphilia*

Metatarsal	**Proximal Epiphyses**	**PE with pathology**	**Percent**	**Distal Epiphyses**	**DE with pathology**	**Percent**
MT I	7	0	0.0	9	2	22.2
MT II	12	0	0.0	7	0	0.0
MT III	10	0	0.0	4	0	0.0
MT IV	8	0	0.0	6	0	0.0
MT V	9	2	22.2	5	0	0.0
Indet MT	0	0	0.0	0	0	0.0

Neither of the metatarsals display significant differences in pathological expression based on side. Table 3.294 presents the statistical analysis of the differences in pathological expression based on side for each metatarsal ray. There is no evidence of trauma, infection, congenital defect, metabolic disorder or infectious or hematopoietic disease on any of the metatarsals from Kissonerga-*Mosphilia*.

Table 3.294: Significance analysis of pathological expression based on side from Kissonerga-*Mosphilia*

Metatarsal	**Side – Chi Squared**
MT I	p=0.837
MT II	N/A
MT III	N/A
MT IV	N/A
MT V	p=0.787
Indet MT	N/A

3.2.25.4 Comparison

Despite the large number of pathological metatarsals as Souskiou-*Laona* and none at Lemba-*Lakkous*, there is no statistically significant difference in pathological expression on the metatarsals across the three sites (Chi Squared p=0.099). When each metatarsal ray is compared across the three sites, there is no statistically significant difference in pathological expression across the three sites[69]. However, there is an interesting difference in the types of pathology observed at the two sites. Souskiou-*Laona* is the only site to display trauma to the metatarsals. While there is no definite cause of the osteoarthritic changes observed on the articular facets of the metatarsals, trauma to an adjacent bone cannot be ruled out as most metatarsals at Souskiou-*Laona* are found within the commingled context. Trauma to the metatarsals is observed as both a minor blunt force causing osteophytes on an otherwise undamaged diaphysis and fractures with large bone callouses caused possibly by a fall. Mild osteoarthritic changes are observed on metatarsals from both Souskiou-*Laona* and Kissonerga-*Mosphilia*. All metatarsal rays are affected with pathology at Souskiou-*Laona*, while only the first and fifth metatarsals are affected at Kissonerga-*Mosphilia*. There is no evidence of infection, congenital defect, metabolic disorder or infectious or hematopoietic disease on any of the metatarsals across the three sites.

3.2.26 Foot phalanges

The discussion of the foot phalanges is organized by the different phalanges. Overall, recovery was fairly poor, given that the expected number of foot phalanges based on the MNI of 263 is 7364 phalanges, the recovery rate is about 12.7% (n=938). Table 3.295 provides a breakdown of the foot phalanges from each site.

Table 3.295: Breakdown of the foot phalanges across the three sites

Foot Phalanges		**Site** Souskiou-*Laona*	**Site** *Lemba-Lakkous*	**Site** Kissonerga-*Mosphilia*	**Total**
1st proximal phalanx	Count	81	9	23	113
	% of phalanges	71.7%	8.0%	20.4%	12.0%
Proximal phalanges	Count	347	60	100	507
	% of phalanges	68.4%	11.8%	19.7%	54.1%
Intermediate phalanges	Count	139	6	35	180
	% of phalanges	77.2%	3.3%	19.4%	19.2%

[69] Chi Squared tests: MT1 – p=0.245; MT2 – p=0.686; MT3 – p=0.686; MT4 – p=0.713; MT5 – p=0.415; Indeterminate MT – could not be assessed as there were no pathologies observed on any.

Foot Phalanges		Site: Souskiou -*Laona*	*Lemba-Lakkous*	Kissonerga-*Mosphilia*	Total
1st distal phalanx	Count	30	1	10	41
	% of phalanges	73.2%	2.4%	24.4%	4.4%
Distal phalanges	Count	55	6	16	77
	% of phalanges	71.4%	7.8%	20.8%	8.2%
Indet phalanges	Count	17	0	3	20
	% of phalanges	85.0%	.0%	15.0%	2.1%
Total	Count	669	82	187	938
	% of phalanges	71.3%	8.7%	19.9%	100.0%

3.2.26.1 Proximal Foot Phalanges

3.2.26.1.1 Souskiou-Laona

Table 3.296 presents the percentage of first proximal and proximal (digits two through five) foot phalanges which were examined and displayed pathology from Souskiou-*Laona*. There are two types of pathology observed on the proximal foot phalanges from Souskiou-*Laona*, osteoarthritic changes and evidence of trauma. None of the subadult proximal foot phalanges display any evidence of pathology.

Table 3.296: Percentage of the proximal foot phalanges with pathology from Souskiou-*Laona*

Phalanx	Age Group	Count	Count with OA	Percent	Count with trauma	Percent	CBA for pathology	Percent
First Proximal	Subadult	1	0	0.0	0	0.0	0	0.0
	Adult	79	11	13.0	3	3.8	8	10.1
	Total	80	11	13.8	3	3.8	8	10.0
Proximal (2-5)	Subadult	6	0	0.0	0	0.0	0	0.0
	Adult	341	28	8.2	14	4.1	34	10.0
	Total	347	28	8.1	14	4.0	34	9.8

Minor trauma in the form of in-active bone growth on the diaphysis is observed on three first proximal foot phalanges, two of which also involve some remodelling of the distal epiphysis. A left first proximal foot phalanx from Bonestack E Tomb 158 displays a small (2mm) globular bone growth on the dorsal aspect of the diaphysis, just distal to the proximal epiphysis on the medial aspect, with no alterations to the epiphyses (Figure 3.189). A left first proximal foot phalanx from North Bonestack Tomb 165 displays very mild osteophytic growth on the medial aspect of the mid-diaphysis and mild rough bone growth on the medial aspect of the distal epiphysis.

Finally, a right first proximal foot phalanx from the Bonestack Tomb 200 displays a narrow line of bone growth on the dorsal aspect of the middle third of the diaphysis, along with severe bone growth on the medial aspect of the distal epiphysis projecting distally (Figure 3.190).

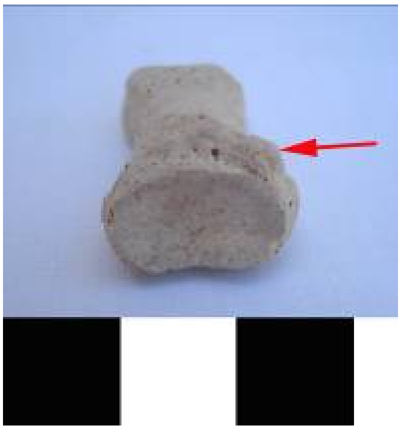


Figure 3.189: (Far left) Left first proximal foot phalanx from Tomb 158 Bonestack E with bone growth on dorsal aspect indicated (proximal view, dorsal is up).

Figure 3.190: (Left) Right first proximal foot phalanx from Tomb 165 North Bonestack with bone growth on the diaphysis and distal epiphysis indicated (dorsal view, distal is up).

Osteoarthritic changes are observed solely on the proximal epiphyses of the first proximal foot phalanges in four cases. A right first proximal foot phalanx from Bonestack E Tomb 158 exhibits bone growth extending proximally 4mm from the lateral aspect of the plantar surface (Figure 3.191). A left first proximal foot phalanx from Bonestack B Tomb 220 displays a small osteophyte on the dorsal-medial aspect of the proximal epiphysis. A left first proximal foot phalanx from North Bonestack Tomb 229 has mild osteophytic growth projecting proximally from the dorsal margin of the proximal epiphysis (Figure 3.192). Finally, a right first proximal foot phalanx from the Bonestack Tomb 200 exhibits possible remodelling of the proximal epiphysis, altering the articular surface. Osteoarthritic changes are observed solely on the distal epiphyses of the first proximal foot phalanges in one case. A right first proximal foot phalanx from Bonestack Tomb 200 displays a 5mm osteophyte projecting proximally from the medial aspect of the dorsal surface (Figure 3.193).

Figure 3.191: (Below left) Right first proximal foot phalanx from Tomb 158 Bonestack E with large osteophyte from the proximal epiphysis indicated (dorsal view, distal is up).

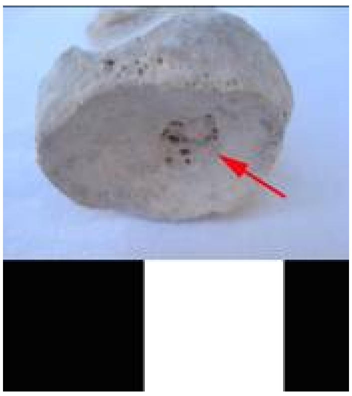
Figure 3.192: (Below centre) Left first proximal foot phalanx from Tomb 229 North Bonestack with mild osteophytic growth at the proximal epiphysis margin indicated (dorsal view, distal is up).

Figure 3.193: (Below right) Right first proximal foot phalanx from Tomb 200 Bonestack with osteophytic growth indicated on the distal epiphysis (medial view, distal is up).

Figure 3.194: (Below left) Left first proximal foot phalanx from Tomb 200 Bonestack with osteophytic growth on the proximal and distal epiphyses indicated (plantar view, distal is up).

Figure 3.195: (Below centre) Right first proximal foot phalanx from Tomb 192 Bonestack with small patch of porosity on proximal epiphysis indicated (proximal view, plantar is up).

Figure 3.196: (Below right) Right first proximal foot phalanx from Tomb 201 Skeleton A with bone growth from the proximal epiphysis and on distal epiphysis indicated (dorsal view, distal is up).



Osteoarthritic changes are observed on both the proximal and distal epiphyses of the first proximal foot phalanges in six cases. One left and one right first proximal foot phalanx from Bonestack Tomb 200 display osteophytic growth on both the proximal and distal epiphyses. The left one has proximally directed bone growth on the plantar aspects of the distal epiphysis extending 2-4mm and osteophytic growth along the margins of the proximal epiphysis 3-5mm creating a substantial concavity (Figure 3.194). The distal epiphysis of the right one from Tomb 200 is remodelled, flattening the lateral facet with some possible eburnation and there is mild osteophytic growth around the margins of the proximal epiphysis with substantial concavity. A right first proximal foot phalanx from Bonestack Tomb 192 displays a small patch of porosity in the middle of the proximal epiphyseal facet with mild osteophytic growth around the margins and flattening of the lateral condyle of the distal epiphysis on the plantar surface (Figure 3.195). The right first proximal foot phalanx from Skeleton A Tomb 201 displays osteophytic growth projecting 3mm from along the margins of the proximal articular surface predominately on the medial margin and there is mild osteophytic growth on the margin of the lateral articular facet of the distal epiphysis (Figure 3.196). The condyles of the distal epiphysis of an indeterminate first proximal foot phalanx and a right first proximal foot phalanx, both from the commingled context of Tomb 168, are flattened with mild bone growth on the margins of the articular surface and possible osteophytic growth on the margins of the proximal epiphysis, but post-mortem damage makes certain assessment difficult.

Table 3.297 presents the percentage of adult first proximal foot phalanges with pathology based on side. There is no statistically significant difference in pathological expression on the proximal first foot phalanx based on side (Chi Squared p=0.423). As there is only one proximal first foot phalanx with pathology from Souskiou-*Laona* with an assessed sex there is no way to discuss the differences in expression.

Table 3.297: Percentage of adult first proximal foot phalanges with pathology by side[70] from Souskiou-*Laona*

Pathology	**Indeterminate**	**Left**	**Right**	**Total**
No pathology	6	21	30	57
OA observed Percent with OA	1 14.3	3 11.5	7 18.4	11 15.5
Trauma observed Percent with trauma	0 0.0	2 7.7	1 2.6	3 4.2
Total	7	26	38	71

[70] The calculations within this table do not include the first proximal foot phalanges which could not be assessed for pathology.

Table 3.298 presents the percentage of proximal and distal epiphyses of the adult first proximal foot phalanges which display pathologies. In general, the distal epiphyses exhibit remodelling of the articular surfaces with some mild osteophytic growth at the margins of the facet, while the proximal epiphyses display osteophytic growth at the margins of the articular facet. These are typically minor changes and it is unclear just what the extent of impact they would have had on an individual's use of the joint.

Table 3.298: Percentage of proximal and distal epiphyses of the proximal foot phalanges with pathology from Souskiou-*Laona*

Phalanx	Proximal Epiphyses	PE with pathology	Percent	Distal Epiphyses	DE with pathology	Percent
Proximal First	69	10	14.5	58	2	3.4
Proximal (2-5)	244	21	8.6	220	21	9.5

Trauma (or possible trauma) and osteoarthritic changes are the only two types of pathology observed on the proximal foot phalanges of digits two through five (Table 3.296 above).In general, the expression of trauma to the proximal foot phalanges derived from Souskiou-*Laona* is quite mild. Small bone growths and slightly mal-aligned diaphyses are typically the only evidence of possible trauma. Table 3.299 provides the context and descriptions of the proximal foot phalanges which display trauma.

Table 3.299: Proximal foot phalanges with evidence of trauma at Souskiou-*Laona*

Context	Description	Epiphyses effected?
Commingled Tomb 132	Mild bone growth on the diaphysis; distal epiphysis is flattened and angled proximally	DE
Commingled Tomb 158	Small (c.1mm) bone growth on the diaphysis with mild proximally directed osteophytic growth on the distal epiphysis condyle	DE
Northwest Bonestack Tomb161	Bone growth on the side of the diaphysis which has altered its shape and osteophytic growth on one of the margin of the proximal epiphysis (Figure 3.197)	PE
Northwest Bonestack Tomb161	Distal third of the diaphysis appears mis-aligned with some remodelling of the distal epiphysis (Figure 3.198)	DE
Bonestack Tomb 192	Thickening of the diaphysis creates a greater plantar curve	No
Bonestack Tomb 192	Thickening of the diaphysis creates a greater plantar curve	No
Bonestack Tomb 192	Remodelled bone and new bone growth on the distal epiphysis to one aspect (Figure 3.199)	DE

Context	Description	Epiphyses effected?
Bonestack Tomb 200	Small (4mm), round, bulbous growth on the surface of the diaphysis (Figure 3.200)	No
Bonestack Tomb 200	Two small (1-2mm) osteophytes on the diaphysis, one in distal third and one in proximal third	No
Bonestack Tomb 200	Diaphysis appears mis-aligned and remodelled but difficult to assess due to post-mortem damage (Figure 3.201)	No
Bonestack Tomb 200	Slight thickening of middle third of the diaphysis, swaying laterally and mild osteophytic growth on margins of proximal epiphysis	PE
Bonestack Tomb 228	Bone growth on the diaphysis, remodelling of the distal epiphysis on the plantar aspect and osteophytic growth on the margins of the proximal epiphysis (Figure 3.202)	PE and DE
Bonestack B Tomb 220	Small osteophyte (c.2mm) on the side of the middle third of the diaphysis (Figure 3.203)	No
Bonestack Tomb 168	Bulbous 2mm bone growth in distal third of diaphysis; distal epiphysis is flattened and angled proximally to one side; mild osteophytic growth on margins of proximal epiphysis (Figure 3.204)	PE and DE

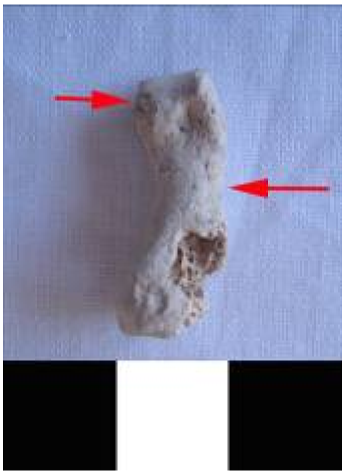
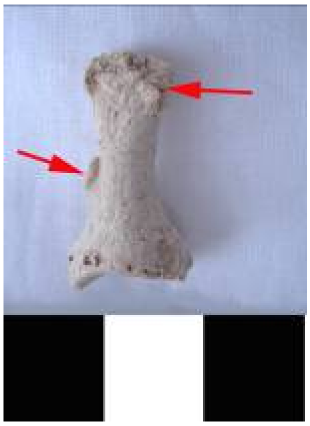


Figure 3.197: (Above left) Proximal foot phalanx from Tomb 161 Northwest Bonestack with osteophytic growth at proximal epiphysis indicated (plantar view, distal is up).

Figure 3.198: (Above centre) Proximal foot phalanx from Tomb 161 Northwest Bonestack with mis-aligned diaphysis and remodelling of the distal epiphysis indicated (plantar view, distal is up).

Figure 3.199: (Above right) Proximal foot phalanx from Tomb 192 Bonestack with remodelled bone at distal epiphysis indicated (dorsal view, distal is up).

Figure 3.200: (Left) Proximal foot phalanx from Tomb 200 Bonestack with bone growth on side of diaphysis indicated (dorsal view, distal is up).



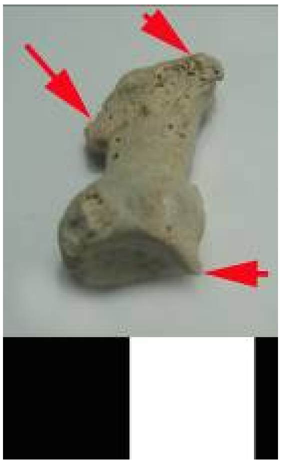


Figure 3.201: (Above left) Proximal foot phalanx from Tomb 200 Bonestack with possible mal-alignment indicated with very poor preservation (plantar view, distal is up).
Figure 3.202: (Above centre) Proximal foot phalanges from Tomb 228 Bonestack – far left phalanx with possible trauma with bone growth on the diaphysis and epiphyses indicated; centre phalanx with proximal epiphysis condyle remodelling indicated; far right phalanx with small osteophyte on the proximal epiphysis indicated (all phalanges in plantar view, distal is up).
Figure 3.203: (Above right) Proximal foot phalanx from Tomb 220 Bonestack B with bone growth on the diaphysis indicated (dorsal view, distal is up).
Figure 3.204: (Left) Proximal foot phalanx from Tomb 168 Bonestack with remodelled bone at the distal epiphysis indicated (plantar view, distal is up).

Osteoarthritic changes reflect the majority of pathologies observed on the proximal foot phalanges at Souskiou-*Laona*. Table 3.298 (above) presents the percentages of proximal and distal epiphyses which display pathology. The proximal and distal epiphyses seem to comparably express osteoarthritic changes. In general, the osteoarthritic changes observed are quite mild in expression. The bone growth does not tend to be extensive and the remodelling of the articular surfaces will affect the articulation with opposing bone, but the extent to which this would have impacted the individual is uncertain, and seems likely to be quite minor. Table 3.300 provides a synopsis of the proximal foot phalanges with osteoarthritic changes from Souskiou-*Laona*.

Table 3.300: Proximal foot phalanges with osteoarthritic changes from Souskiou-*Laona*

Context	Description of pathology	Epiphyses effected
Bonestack Tomb 200	Distal epiphysis is remodelled/flattened on the plantar aspect (Figure 3.205)	DE
Bonestack Tomb 200	Remodelling of the distal epiphysis, predominately to one side with bone growth (Figure 3.206)	DE
Bonestack Tomb 200	Small (>1mm) osteophytes between the plantar bulbs of the proximal epiphysis	PE
Bonestack Tomb 200	Small (>1mm) osteophytes between the plantar bulbs of the proximal epiphysis	PE
Bonestack Tomb 200	Mild bone (2-4mm) growth at the margin of the proximal epiphysis (Figure 3.207)	PE
Bonestack Tomb 200	Resorption/remodelling of the plantar aspect of the proximal epiphysis with concavity between the bulbs	PE
Commingled Tomb 132	Distal epiphysis condyle is flattened with no curvature	DE
Commingled Tomb 132	Proximal epiphysis shows some bone growth and resorption on the planter and lateral aspects with possible slight eburnation of the distal epiphysis (Figure 3.208)	PE and DE
Commingled Tomb 132	Distal epiphysis is concave with osteophytic growth along margin of articular surface (Figure 3.209)	DE
Bonestack E Tomb 158	Distal epiphysis appears remodelled and slanted proximally on one side with a small osteophyte on the margin of the proximal epiphysis	PE and DE
Bonestack E Tomb 158	Bone growth on the plantar aspect of proximal epiphysis	PE
Commingled Tomb 168	Bone growth and remodelling in the cavity between the bulbs – post-mortem damage makes it difficult to assess the extension of the epiphysis	PE
Commingled Tomb 168	Mild remodelling of one of the bulbs of the proximal epiphysis, as it appears indented slightly	PE
Bonestack Tomb 192	Mild proximal bone growth off the plantar facet of the distal epiphysis	DE
Bonestack Tomb 228	Distal epiphysis is remodelled, predominately on the margins with bone growth (Fig 3.210)	DE
Bonestack Tomb 228	Mild osteophytic growth along the margins of the proximal epiphysis (see Figure 3.202 above)	PE
Bonestack Tomb 228	Proximal epiphysis displays a remodelled lateral bulb and osteophytes projecting proximally (see Figure 3.202 above)	PE
Bonestack Tomb 228	Osteophytic growth on the margins of the proximal epiphysis, proximally directed with remodelling (Figure 3.211)	PE
North Bonestack Tomb 165	Distal epiphysis is remodelled/flattened on the plantar aspect	DE
North Bonestack Tomb 165	Osteophytic growth proximal of the distal epiphysis has extended the distal epiphysis	DE
Skeleton F Tomb 165	Mild osteophytic growth at the margins of the proximal epiphysis	PE
Commingled quadrant III Tomb 125	Mild osteophytic growth around the margin of the distal epiphysis articular facet and remodelling of the proximal epiphysis	PE and DE

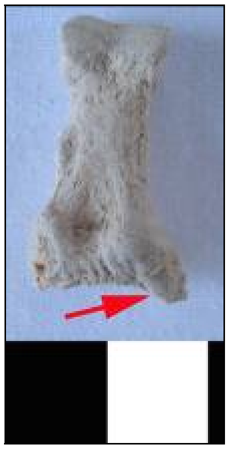
Context	Description of pathology	Epiphyses effected
Bonestack Tomb 160	Bone growth ridge on the distal epiphysis, proximal of the condyle and mild remodelling of the proximal epiphysis (Figure 3.212)	PE and DE
Bonestack Tomb 160	Mild osteophytic growth at the margins of and remodelling of the proximal epiphysis	PE
Bonestack B Tomb 220	Distal epiphysis displays changes in the articular surface and osteophytic growth (Figure 3.213)	DE
Bonestack B Tomb 220	Distal epiphysis displays changes in the articular surface and osteophytic growth (Figure 3.213)	DE
Bonestack B Tomb 220	Distal epiphysis displays changes in the articular surface and osteophytic growth (Figure 3.213)	DE
Bonestack C Tomb 220	Fairly severe osteophytic growth on the plantar side of the proximal epiphysis extending proximally c.5mm (Figure 3.214)	PE

Figure 3.205: (Below left) Proximal foot phalanx from Tomb 200 Bonestack with remodelled/flattened distal epiphysis indicated (medial or lateral view, plantar is left, distal is up).

Figure 3.206: (Below centre left) Proximal foot phalanx from Tomb 200 Bonestack with bone growth and remodelled distal epiphysis indicated (dorsal view, distal is up).

Figure 3.207: (Below centre right) Proximal foot phalanx from Tomb 200 Bonestack with osteophytic growth on the proximal epiphysis indicated (plantar view, distal is up).

Figure 3.208: (Below right) Proximal foot phalanx from Tomb 132 Commingled with bone growth on the proximal epiphysis and remodelled distal epiphysis indicated (plantar view, distal is up).



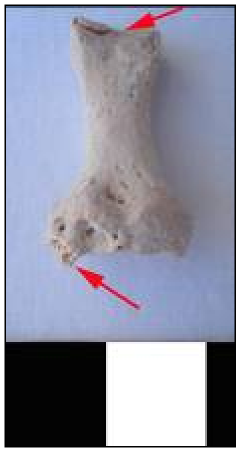


Figure 3.209: (Below left) Proximal foot phalanx from Tomb 132 Commingled with remodelled distal epiphysis indicated (plantar view, distal is up).

Figure 3.210: (Below centre left) Proximal foot phalanx from Tomb 228 Bonestack with mild remodelling of the distal epiphysis indicated (dorsal view, distal is up).

Figure 3.211: (Below centre right) Proximal foot phalanx from Tomb 228 Bonestack with osteophytic growth projecting proximally from the proximal epiphysis indicated (plantar view, distal is up).

Figure 3.212: (Below right) Proximal foot phalanx from Tomb 160 Bonestack with bone growth on distal epiphysis indicated (plantar view, distal is up).

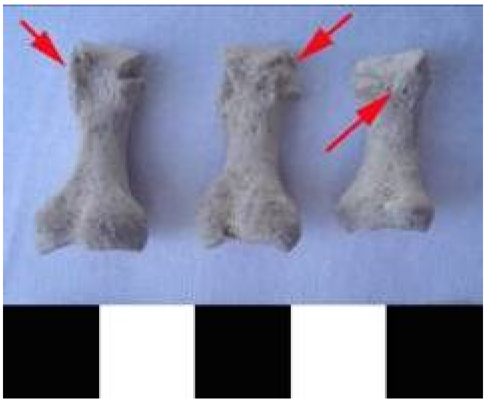


Figure 3.213: (Far left) Proximal foot phalanges from Tomb 220 Bonestack B with remodelling of the distal epiphyses indicated (plantar view, distal is up).

Figure 3.214: (Left) Proximal foot phalanx from Tomb 220 Bonestack C with osteophyte on proximal epiphysis indicated (plantar view, distal is up).

3.2.26.1.2 Lemba-Lakkous

Table 3.301 presents the percentage of first proximal and proximal (digits two through five) foot phalanges which were examined and displayed pathology from Lemba-*Lakkous*. Osteoarthritic changes are the only pathology observed on the proximal foot phalanges. None of the subadult proximal foot phalanges display any evidence of pathology.

Table 3.301: Percentage of the proximal foot phalanges with pathology from Lemba-*Lakkous*

Phalanx	Age Group	Count	Count with OA	Percent	CBA for pathology	Percent
First Proximal	Subadult	3	0	0.0	0	0.0
	Adult	6	1	16.7	1	16.7
	Total	9	1	11.1	1	11.1
Proximal (2-5)	Subadult	24	0	0.0	1	4.2
	Adult	36	2	5.6	2	5.6
	Total	60	2	3.3	3	5.0

The left first proximal foot phalanx from Grave 23 displays remodelled rough bone on the plantar aspect of the proximal epiphysis, however post-mortem damage makes assessment of the extent difficult (see Figure 3.28 above). Table 3.302 presents the percentage of pathology observed on the first proximal foot phalanges by side.

Table 3.302: Percentage of adult first proximal foot phalanges with pathology by side[71] from Lemba-*Lakkous*

Pathology	Left	Right	Total
No pathology	2	2	4
OA observed Percent with OA	1 33.3	0 0.0	1 20.0
Total	3	2	5

Table 3.303 presents the percentage of proximal and distal epiphyses of the adult first proximal foot phalanges which display pathologies. The osteoarthritic changes to the sole first proximal phalanx are quite minor and it is unclear just what the extent of impact they would have had on an individual's life.

Table 3.303: Percentage of proximal and distal epiphyses of the proximal foot phalanges with pathology from Lemba-*Lakkous*

Phalanx	Proximal Epiphyses	PE with pathology	Percent	Distal Epiphyses	DE with pathology	Percent
Proximal First	5	1	20.0	5	0	0.0
Proximal (2-5)	29	0	0.0	31	2	6.5

Osteoarthritic change is the only pathology observed on the proximal foot phalanges (Table 3.301 above). The distal epiphysis of a proximal foot phalanx from Grave 50 is

[71] The calculations within this table do not include the first proximal foot phalanges which could not be assessed for pathology.

remodelled with very mild bone growth extending towards the proximal end (Figure 3.215). A proximal foot phalanx from Grave 56 displays proximately directed bone growth of the plantar articular surface of the distal epiphysis (see Figure 3.27 above – Table 3.303). There is no evidence of trauma, infection, congenital defect or metabolic disorder or infectious or hematopoietic disease.

Figure 3.215: Proximal foot phalanx from Grave 50 with mild remodelling and bone growth indicated (plantar view, distal is up).

3.2.26.1.3 Kissonerga-Mosphilia

Table 3.304 presents the percentage of first proximal and proximal (digits two through five) foot phalanges which were examined and displayed pathology from Kissonerga-*Mosphilia*. There are two types of pathology observed on the proximal foot phalanges from Kissonerga-*Mosphilia*, osteoarthritic changes and evidence of trauma. None of the subadult proximal foot phalanges display any evidence of pathology.

Table 3.304: Percentage of the proximal foot phalanges with pathology from Kissonerga-*Mosphilia*

Phalanx	**Age Group**	**Count**	**Count with OA**	**Percent**	**Count with trauma**	**Percent**	**CBA for pathology**	**Percent**
First Proximal	Subadult	13	0	0.0	0	0.0	0	0.0
	Adult	10	1	10.0	0	0.0	0	0.0
	Total	23	1	4.3	0	0.0	0	0.0
Proximal (2-5)	Subadult	52	0	0.0	0	0.0	0	0.0
	Adult	48	4	8.3	1	2.1	0	0.0
	Total	100	4	4.0	1	1.0	0	0.0

The right first proximal foot phalanx from Grave 561 displays very mild osteophytic growth on the medial margin of the proximal epiphysis. Table 3.305 presents the percentage of pathology observed on the first proximal foot phalanges by side.

Table 3.305: Percentage of adult first proximal foot phalanges with pathology by side[72] from Kissonerga-*Mosphilia*

Pathology	**Left**	**Right**	**Total**
No pathology	4	5	9
OA observed Percent with OA	0 0.0	1 20.0	1 10.0
Total	4	6	10

Table 3.306 presents the percentage of proximal and distal epiphyses of the adult first proximal foot phalanges which display pathologies. The osteoarthritic changes to the sole first proximal phalanx are quite minor and it is unclear just what the extent of impact they would have had on an individual's life.

Table 3.306: Percentage of proximal and distal epiphyses of the proximal foot phalanges with pathology from Kissonerga-*Mosphilia*

Phalanx	**Proximal Epiphyses**	**PE with pathology**	**Percent**	**Distal Epiphyses**	**DE with pathology**	**Percent**
Proximal First	10	1	10.0	10	0	0.0
Proximal (2-5)	42	2	4.8	43	3	7.0

Osteoarthritic changes and possible trauma were both observed on the proximal foot phalanges from Kissonerga-*Mosphilia* (Table 3.304 above). Two proximal foot phalanges from Grave 506 display very mild proximally directed bone growth of one of the condyles on the plantar aspect of the distal epiphysis (Figure 3.216). The distal epiphysis of a proximal foot phalanx from South Skeleton Grave 539 appears flattened with bone growth extending proximally on the plantar aspect (see Figure 3.51 above). A proximal foot phalanx from Grave 559 displays a small bone growth on the lateral aspect of the proximal epiphysis. Finally, one proximal foot phalanx from Grave 571 displays possible evidence of healed trauma in the form of mild bone growth on the distal third of the diaphysis and very mild osteophytic growth on the margins of the proximal epiphysis (Figure 3.217). The distal epiphysis is affected more frequently than the proximal (Table 3.306).

[72] The calculations within this table do not include the first proximal foot phalanges which could not be assessed for pathology.

Figure 3.216: (Far left)
Proximal foot phalanges from Grave 506 with very mild remodelling of the distal epiphyses indicated (plantar view, distal is up).

Figure 3.217: (Left)
Proximal foot phalanx from Grave 571 with bone growth indicated in the distal third of the diaphysis and proximal epiphysis (plantar view, distal is up).

3.2.26.1.4 Comparison

All three sites contain proximal foot phalanges with pathology. In general, Souskiou-*Laona* displays quite a few more phalanges with more severe osteoarthritic changes and incidences of trauma. There is no statistically significant difference in pathological expression on the adult proximal first foot phalanges across the three sites (Chi Squared p=0.795). There is also no significant difference in pathological expression based on side (Chi Squared p=0.565). This is interesting as 88.2% of the proximal first phalanges with pathology occur at Souskiou-*Laona*. There is no statistically significant difference in pathological expression on the proximal phalanges for the second through fifth digits across the three sites (Chi Squared p=0.468). Again, the greatest number (85.7%) of phalanges with pathology are derived from Souskiou-*Laona*. In general, the osteoarthritic changes and incidences of trauma affecting the proximal foot phalanges are quite mild. Comparison based on males and females is not possible given the inability to provide a sex determination for most of the phalanges derived from Souskiou-*Laona*. There is no evidence for infection, congenital defects or metabolic disorders or infectious or hematopoietic disease.

3.2.26.2 Intermediate Foot Phalanges

3.2.26.2.1 Souskiou-Laona

Table 3.307 presents the percentage of intermediate foot phalanges which were examined and displayed pathology from Souskiou-*Laona*. The intermediate foot phalanges from Souskiou-*Laona* exhibit evidence of osteoarthritic changes and possible trauma. None of the subadult intermediate foot phalanges display any evidence of pathology.

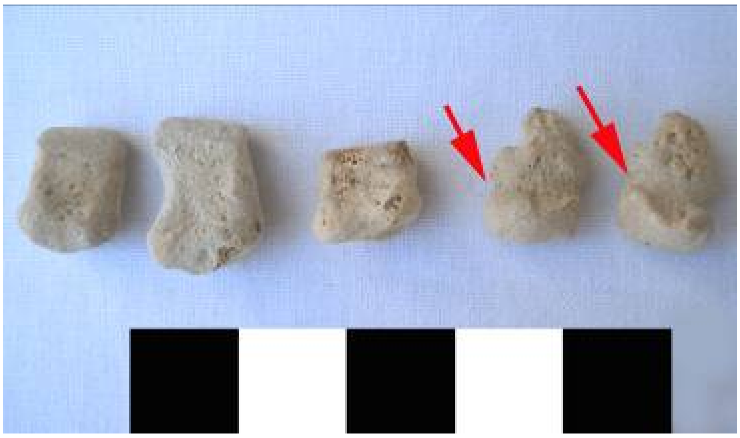
Table 3.307: Percentage of the intermediate foot phalanges with pathology from Souskiou-*Laona*

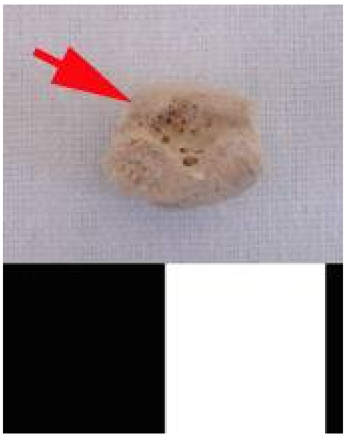
Age Group	**Count**	**Count with OA**	**Percent**	**Count with trauma**	**Percent**	**CBA for pathology**	**Percent**
Subadult	6	0	0.0	0	0.0	0	0.0
Adult	133	21	15.8	3	2.3	8	6.0
Total	139	21	15.1	3	2.2	8	5.9

Three intermediate phalanges display evidence of trauma or possibly a congenital trait (Steinberg and Reynolds 1948). All three cases reflect intermediate phalanges distally ankylosed to the distal phalanx. Two of the ankylosed intermediate-distal phalanges are from the commingled context Tomb 132 and the third is from the commingled context Tomb 168 (Figure 3.218). There are seven intermediate phalanges which display a thickened diaphysis which occurs as a proximal-distal compression of the diaphysis and typically displays remodelling of the distal epiphysis. Possible causes for this change in morphology include: repetitive heavy use, trauma or general osteoarthritic changes. Bones which display this pathology have been classed as osteoarthritic changes due to the type of bone growth often associated with them. Five of the intermediate foot phalanges with a thickened diaphysis are derived from the commingled context Tomb 132; all of which display some remodelling of the distal epiphysis as well, changing the articular surface (see Figure 3.218). The other two cases are derived from Tomb 158: an intermediate foot phalanx from Bonestack E displays a thickened diaphysis, while the other is from commingled context C and displays a thickened diaphysis with remodelling of the distal epiphysis (Figure 3.219).

Figure 3.218: (Below left) Intermediate foot phalanges from Tomb 132 commingled context: The three phalanges on the left display the remodelled compressed diaphyses with unusual morphologies; the two phalanges on the right exhibit possible trauma in the form of ankylosed intermediate and distal foot phalanges as indicated by the arrows (all phalanges plantar view, distal is up).

Figure 3.219: (Below right) Intermediate foot phalanx from Tomb 158 Commingled context C with remodelled distal epiphysis indicated and thickened/compressed diaphysis (plantar view, distal is up).





General osteoarthritic changes are observed on at least 14 intermediate foot phalanges. Table 3.308 provides the context and description for each intermediate foot phalanx with osteoarthritic changes.

Table 3.308: Intermediate foot phalanges with osteoarthritic changes from Souskiou-*Laona*

Context	**Description of pathology**	**Epiphyses effected?**
Commingled quadrant II Tomb 125	Distal epiphysis is flattened and angled towards the proximal end (Figure 3.220)	DE
Commingled Tomb 125	Indent on the plantar side of the distal epiphysis	DE
Bonestack Tomb 192	Osteophytic growth projecting proximally from the margins of the proximal epiphysis (Figure 3.221)	PE
Bonestack E Tomb 158	Mild bone growth extending the articular surface of the proximal epiphysis	PE
Northwest Bonestack Tomb 161	Mild osteophytic growth around the margin of the proximal epiphysis but post-mortem damage makes it difficult to assess extent	PE
South Skeleton Tomb 108	Mild remodelling of the distal epiphysis angling one corner towards the proximal end	DE
Bonestack Tomb 159	Very mild osteophytic growth along the margin of the proximal epiphysis and bone growth on distal epiphysis (Figure 3.222)	PE and DE
Commingled Tomb 168	Distal epiphysis is flattened with severe wear	DE
Bonestack C Tomb 220	Severe osteophytic growth proximally directed on plantar aspect of the proximal epiphysis (Figure 3.224)	PE
Bonestack C Tomb 220	Severe osteophytic growth proximally directed on plantar aspect of the proximal epiphysis (Figure 3.224)	PE

Context	Description of pathology	Epiphyses effected?
Bonestack Tomb 228	Distally-proximally compressed diaphysis with osteophytes projecting proximally from the proximal epiphysis (Figure 3.225)	PE
Bonestack Tomb 228	Distally-proximally compressed diaphysis with osteophytes projecting proximally from the proximal epiphysis (Figure 3.225)	PE
Bonestack Tomb 228	Distally-proximally compressed diaphysis with osteophytes projecting proximally from the proximal epiphysis (Figure 3.225)	PE
Skeleton E Tomb 228	Osteophytic growth on the plantar side of the distal epiphysis projecting proximally (Figure 3.223)	DE

Figure 3.220: (Below left) Intermediate foot phalanx from Tomb 125 quadrant II commingled context with changes to the distal epiphysis and diaphysis (dorsal view, distal is up).

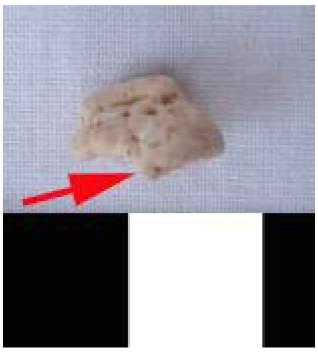
Figure 3.221: (Below centre left) Intermediate foot phalanx from Tomb 192 Bonestack with osteophytic growth on the proximal epiphysis indicated (plantar view, distal is up)

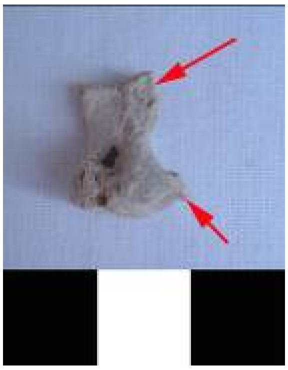
Figure 3.222: (Below centre right) Intermediate foot phalanx from Tomb 159 Bonestack with bone growth on the distal and proximal epiphyses indicated (dorsal view, distal is up).

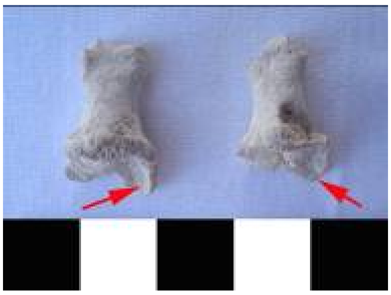
Figure 3.223: (Below right) Intermediate foot phalanx from Tomb 228 Skeleton E with mild bone growth indicated (dorsal view, distal is up).

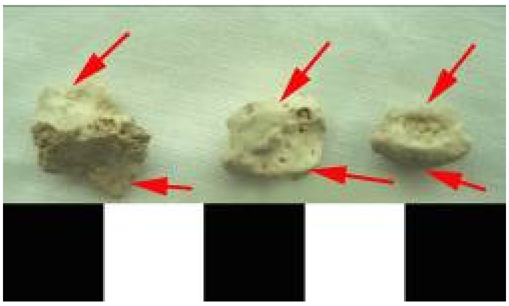
Figure 3.224: (Far bottom left) Intermediate foot phalanges from Tomb 220 Bonestack C with osteophytic growth on the proximal epiphyses indicated (dorsal view, distal is up).

Figure 3.225: (Far bottom right) Intermediate foot phalanges from Tomb 228 Bonestack with osteophytic growth on the proximal epiphysis and compressed diaphyses indicated (all in plantar view, distal is up).









There is fairly similar frequency of expression of pathology on the proximal and distal epiphyses, when the intermediate phalanges with thickened diaphyses are included (Table 3.309). The pathological variations observed on the intermediate foot phalanges are typically quite mild and the often slight variability in morphology can make it difficult to conclusively identify the causes of pathology. Radiographs of the phalanges with thickened diaphyses would aid in determining whether the causes of the changes observed reflect traumatic fractures.

Table 3.309: Percentage of proximal and distal epiphyses of the intermediate foot phalanges with pathology from Souskiou-*Laona*

Proximal Epiphyses	**PE with pathology**	**Percent**	**Distal Epiphyses**	**DE with pathology**	**Percent**
111	9	8.1	103	12	11.7

3.2.26.2.2 Lemba-Lakkous

Table 3.310 presents the percentage of intermediate foot phalanges which were examined and displayed pathology from Lemba-*Lakkous*. There is no evidence of pathology on the intermediate foot phalanges from Lemba-*Lakkous*.

Table 3.310: Percentage of the intermediate foot phalanges observed from Lemba-*Lakkous*

Age Group	**Count**	**Percent**	**CBA for pathology**	**Percent**
Subadult	2	33.3	0	0.0
Adult	4	66.7	0	0.0
Total	6	100.0	0	0.0

3.2.26.2.3 Kissonerga-Mosphilia

Table 3.311 presents the percentage of intermediate foot phalanges which were examined and displayed pathology from Kissonerga-*Mosphilia*. The intermediate foot phalanges from Kissonerga-*Mosphilia* display possible evidence of osteoarthritic changes. None of the subadult intermediate foot phalanges display any evidence of pathology.

Table 3.311: Percentage of the intermediate foot phalanges with pathology from Kissonerga-*Mosphilia*

Age Group	**Count**	**Count with OA**	**Percent**	**CBA for pathology**	**Percent**
Subadult	26	0	0.0	1	0.0
Adult	9	2	22.2	1	11.1
Total	35	2	5.7	2	5.7

Both intermediate phalanges with osteoarthritic changes are from Grave 571 and both display remodelling and bone growth of the proximal epiphysis and thickening of the diaphysis (see Figure 3.49 above). As with Souskiou-*Laona*, the thickening of the diaphysis and changes to the general morphology of the articular surfaces and diaphysis may reflect trauma or possibly a response to repetitive or hard use of the feet causing an osseous reaction.

3.2.26.2.4 Comparison

Overall, despite the very different proportions of pathological adult intermediate foot phalanges, there is no statistically significant difference in pathological expression across the three sites (Chi Squared p=0.609). There is evidence of possible trauma or congenital defect at Souskiou-*Laona* with the ankylosis of several intermediate and distal phalanges and there is evidence of osteoarthritic changes to the proximal and distal epiphyses at Souskiou-*Laona* and Kissonerga-*Mosphilia*. Both sites also display a thickening and remodelling of the diaphyses of several phalanges which may not be pathological in nature. There is no evidence for infection or metabolic disorder or infectious or hematopoietic disease.

<u>*3.2.26.3 Distal Foot Phalanges*</u>

3.2.26.3.1 Souskiou-Laona

Table 3.312 presents the percentage of first distal and distal (digits two through five) foot phalanges which were examined and displayed pathology from Souskiou-*Laona*. There are two types of pathology observed on the distal foot phalanges from Souskiou-*Laona*, osteoarthritic changes and evidence of trauma (or possible congenital defects). None of the subadult proximal foot phalanges display any evidence of pathology.

Table 3.312: Percentage of the distal foot phalanges with pathology from Souskiou-*Laona*

Phalanx	Age Group	Count	Count with OA	Percent	Count with trauma	Percent	CBA for pathology	Percent
First Distal	Subadult	1	0	0.0	0	0.0	0	0.0
	Adult	30	14	46.7	1	3.3	2	6.7
	Total	31	14	45.2	1	3.2	2	6.5
Distal (2-5)	Subadult	0	0	0.0	0	0.0	0	0.0
	Adult	55	13	23.6	1	1.8	1	1.8
	Total	55	13	23.6	1	1.8	1	1.8

Figure 3.226: Right distal first foot phalanx from Tomb 228 Bonestack with bone growth on the diaphysis indicated (plantar view, distal is up).

Trauma is observed on a right first distal foot phalanx from the Bonestack Tomb 228 in the form of thickening and remodelling of the diaphysis, making it appear misshapen (Figure 3.226). Radiographs are required to be certain of trauma. Osteoarthritic changes affect almost half the adult first distal foot phalanges. Table 3.313 provides descriptions and the context information for the distal first foot phalanges with pathology.

Table 3.313: First distal foot phalanges with osteoarthritic changes from Souskiou-*Laona*

Context	Side	Description	Epiphyses effected
Bonestack E Tomb 158	Right	Two osteophytes projecting from the medial aspect of the proximal epiphysis, remodelled and thick (Figure 3.227)	PE
Commingled C Tomb 158	Left	Mild bone growth on the plantar aspect of the proximal epiphysis extending distally (Figure 3.228)	PE
Commingled C Tomb 158	Left	Bone growth on the plantar aspect of the proximal epiphysis with an osteopyte on the medial aspect and the distal epiphysis is remodelled (Figure 3.229)	PE and DE
Bonestack Tomb 200	Left	Bulbous bone growth on the medial aspect of the proximal epiphysis	PE

Context	Side	Description	Epiphyses effected
Bonestack Tomb 200	Left	Remodelling and extension of the articular facet on the plantar aspect of the proximal epiphysis (Figure 3.230)	PE
Bonestack Tomb 200	Left	c. 9mm bone growth from the proximal epiphysis, proximally directed on the medial aspect (Figure 3.231)	PE
Bonestack Tomb 200	Right	c. 7mm bone growth from the proximal epiphysis, proximally directed on the medial aspect (Figure 3.232)	PE
Skeleton C Tomb 200	Left	Severe osteophytic growth proximally and medially from the plantar and dorsal aspects of the proximal epiphysis (Figure 3.233)	PE
Commingled Tomb 228	Indeterminate	Mild osteophytic growth proximally directed from the proximal epiphysis	PE
Commingled Tomb 168	Left	Small osteophytic projection on the lateral aspect of the proximal epiphysis	PE
West Skeleton Tomb 132	Right	Proximal epiphysis displays some extension of the articular surface	PE
Commingled quadrant II Tomb 125	Indeterminate	Mild osteophytic growth and extension of the proximal facet on the plantar aspect, post-mortem damage makes it difficult to assess extent	Diaphysis
Commingled Tomb 125	Indeterminate	New bone growth on the plantar aspect and the margin of the proximal epiphysis, however fragmentation makes the extent difficult to assess	PE
North Bonestack Tomb 229	Right	Osteophytes projecting proximally from the plantar aspect of the proximal epiphysis (Figure 3.234)	PE

Figure 3.227: (Below left) Right distal first foot phalanx from Tomb 158 Bonestack E with osteophytes from the proximal epiphysis indicated (dorsal view, distal is up)

Figure 3.228: (Below centre) Left distal first foot phalanx from Tomb 158 Commingled C context with bone growth from the proximal epiphysis indicated (plantar view, distal is up).

Figure 3.229: (Below right) Left distal first foot phalanx from Tomb 158 Commingled C context with small osteophyte from medial side indicated (plantar view, distal is up).

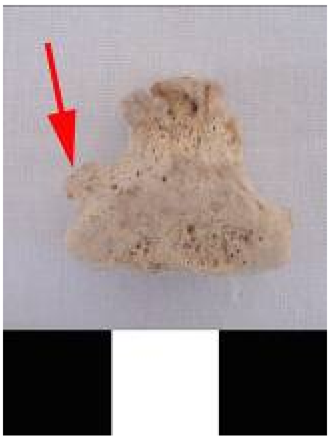
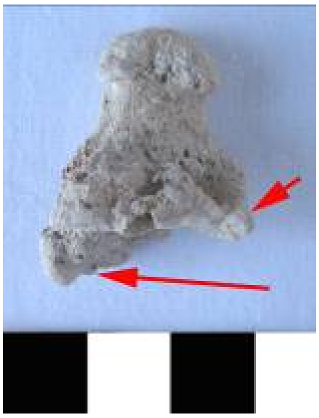
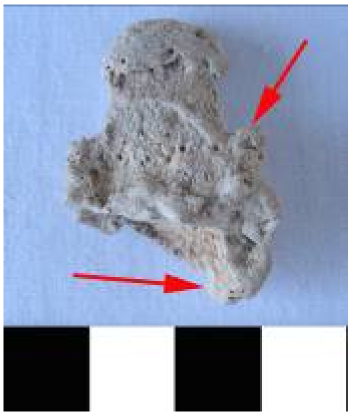


Figure 3.230: (Below left) Left distal first foot phalanx from Tomb 200 Bonestack with bone growth extending up the plantar aspect from the proximal epiphysis indicated (plantar view, distal is up)

Figure 3.231: (Below centre) Left distal first foot phalanx from Tomb 200 Bonestack with osteophytic growth from the medial margin of the proximal epiphysis indicated (plantar view, distal is up).

Figure 3.232: (Below right) Right distal first foot phalanx from Tomb 200 Bonestack with osteophytic growth from the medial margin of the proximal epiphysis indicated (plantar view , distal is up).





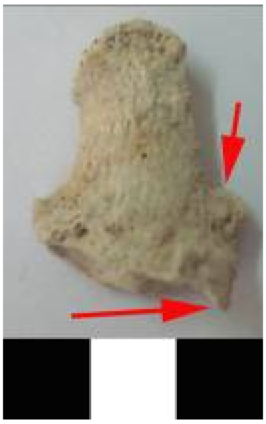


Figure 3.233: (Far left) Left distal first foot phalanx from Tomb 200 Skeleton C with osteophytic growth on the medial aspect indicated (dorsal view, distal is up).

Figure 3.234: (Left) Right distal first foot phalanx from Tomb 229 North Bonestack with osteophytic growth from the proximal epiphysis indicated (plantar view, distal is up).

Half of the distal first foot phalanges which could be assessed, display evidence of osteoarthritic changes, the left side displaying the highest prevalence (Table 3.314) There is no statistically significant difference in pathological expression on the distal first foot phalanges based on side (Chi Squared p=0.588). As with the other foot bones at Souskiou-*Laona*, most distal phalanges are from commingled bonestack contexts so there is little value in analyzing the differences in pathological expression based on sex.

Table 3.314: Percentage of adult first distal foot phalanges with pathology by side[73] from Souskiou-*Laona*

Pathology	Indeterminate	Left	Right	Total
No pathology	1	5	7	13
OA observed Percent with OA	3 75.0	7 58.3	4 33.3	14 50.0
Trauma observed Percent with trauma	0 0.0	0 0.0	1 8.3	1 3.6
Total	4	12	12	28

Table 3.315 presents the percentage of proximal and distal epiphyses of the adult first distal foot phalanges which display pathologies. In general, the proximal epiphysis displays osteophytic growth to varying degrees, which would have had some impact on the distal epiphysis of the intermediate phalanges.

Table 3.315: Percentage of proximal and distal epiphyses of the distal foot phalanges with pathology from Souskiou-*Laona*

Phalanx	Proximal Epiphyses	PE with pathology	Percent	Distal Epiphyses	DE with pathology	Percent
Distal First	27	13	48.1	23	1	4.3
Distal (2-5)	53	7	13.2	49	7	14.3

Osteoarthritic changes are the most prevalent pathology observed on the distal foot phalanges (not including the first digit). The one distal foot phalanx which displays evidence of trauma in the form of a fragment of an intermediate phalanx ankylosed to the proximal epiphysis is from the Bonestack Tomb 228 (see Figure 3.218 above for examples of ankylosed distal foot phalanges and above for discussion on possible congenital causes). Table 3.316 provides the context and details of the osteoarthritic changes observed on the distal foot phalanges.

Table 3.316: Distal foot phalanges with osteoarthritic changes from Souskiou-*Laona*

Context	Description of pathology	Epiphyses effected?
Commingled Tomb 132	Bone growth from the distal epiphysis towards the proximal epiphysis, thickening the diaphysis with mild osteophytic growth at proximal epiphysis (Figure 3.235)	PE
Commingled Tomb 132	Bone growth from the distal epiphysis towards the proximal epiphysis, thickening the diaphysis with mild osteophytic growth at proximal epiphysis (Figure 3.236)	PE

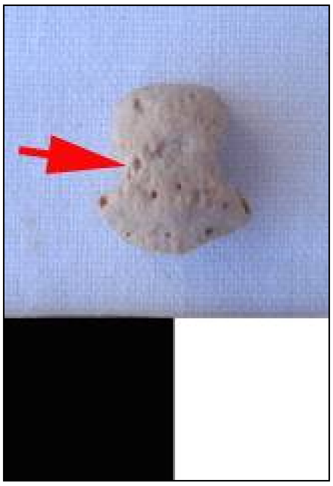
[73] The calculations within this table do not include the first proximal foot phalanges which could not be assessed for pathology.

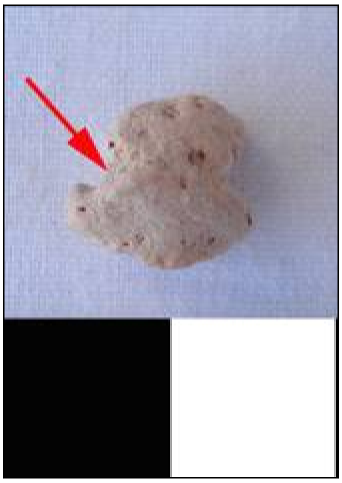
Context	Description of pathology	Epiphyses effected?
Bonestack E Tomb 158	Bone growth and remodelling of the diaphysis and distal epiphysis (Figure 3.237)	DE
Bonestack E Tomb 158	Bone growth and remodelling of the diaphysis and distal epiphysis (Figure 3.238)	DE
Bonestack E Tomb 158	Small osteophyte on the proximal epiphysis, plantar aspect	PE
Commingled C Tomb 158	Proximally directed osteophytic growth at the distal epiphysis (Figure 3.239)	DE
Commingled C Tomb 158	Proximally directed osteophytic growth at the distal epiphysis (Figure 3.239)	DE
Commingled C Tomb 158	Extension and remodelling of the distal epiphysis (Figure 3.239)	DE
Commingled C Tomb 158	Extension and remodelling of the distal epiphysis (Figure 3.239)	DE
Bonestack Tomb 192	Small osteophytic growth on the superior aspect of the distal epiphysis projecting dorsally	DE
Bonestack Tomb 228	Proximally directed osteophytic growth on the proximal epiphysis	PE
Commingled Tomb 228	Mild osteophytic growth on the dorsal margin of the proximal epiphysis	PE
Commingled Tomb 228	Mild osteophytic growth on the dorsal margin of the proximal epiphysis	PE

Figure 3.235: (Below left) Distal foot phalanx from Tomb 132 Commingled context with thickened diaphysis indicated (plantar view, distal is up).

Figure 3.236: (Below centre) Distal foot phalanx from Tomb 132 Commingled context with thickened diaphysis indicated (plantar view, distal is up).

Figure 3.237: (Below right) Distal foot phalanx from Tomb 158 Bonestack E with remodelled distal epiphysis indicated (plantar view, distal is up).





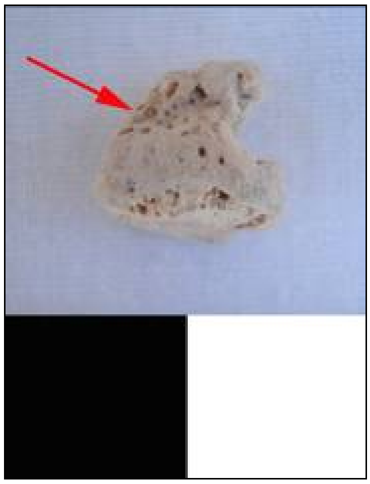
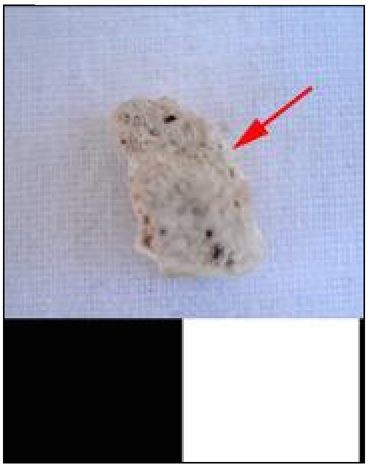
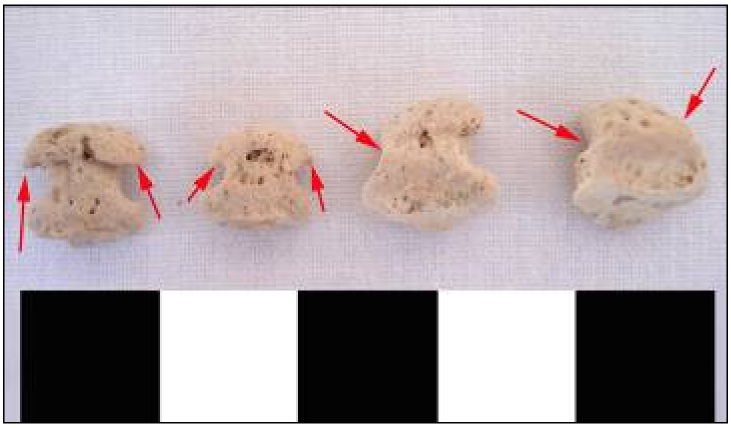


Figure 3.238: (Below left) Distal foot phalanx from Tomb 158 Bonestack E with remodelled diaphysis and distal epiphysis indicated (plantar view, distal is up).

Figure 3.239: (Below right) Distal foot phalanges from Tomb 158 Commingled C context: two phalanges to the left display bone growth proximally from distal epiphysis; two right phalanges display bone growth from the distal epiphysis with thickened diaphysis (all are in plantar view, distal is up).





Both proximal and distal epiphyses display fairly comparable frequencies of pathology amongst the distal foot phalanges (see above Table 3.315). There is no evidence of infection, metabolic disorders or infectious or hematopoietic disease or congenital defect on any of the distal foot phalanges.

3.2.26.3.2 Lemba-Lakkous

Table 3.317 presents the percentage of first distal and distal (digits two through five) foot phalanges which were examined from Lemba-*Lakkous*. There is no evidence of pathology on any of the distal foot phalanges from Lemba-*Lakkous*.

Table 3.317: Percentage of the distal foot phalanges with pathology from Lemba-*Lakkous*

Phalanx	Age Group	Count	Percent	CBA for pathology	Percent
First Distal	Subadult	0	0.0	0	0.0
	Adult	1	100.0	0	0.0
	Total	1	100.0	0	0.0
Distal (2-5)	Subadult	2	33.3	0	0.0
	Adult	4	66.7	0	0.0
	Total	6	100.0	0	0.0

3.2.26.3.3 Kissonerga-Mosphilia

Table 3.318 presents the percentage of first distal and distal (digits two through five) foot phalanges which were examined and displayed pathology from Kissonerga-*Mosphilia*. There are two types of pathology observed on the distal foot phalanges from Souskiou-*Laona*, osteoarthritic changes and evidence of trauma. None of the subadult proximal foot phalanges display any evidence of pathology.

Table 3.318: Percentage of the distal foot phalanges with pathology from Kissonerga-*Mosphilia*

Phalanx	**Age Group**	**Count**	**Count with OA**	**Percent**	**Count with trauma**	**Percent**	**CBA for pathology**	**Percent**
First Distal	Subadult	7	0	0.0	0	0.0	0	0.0
	Adult	3	1	33.3	0	0.0	1	33.3
	Total	10	1	10.0	0	0.0	1	10.0
Distal (2-5)	Subadult	9	0	0.0	0	0.0	0	0.0
	Adult	7	0	0.0	2	28.6	0	0.0
	Total	16	0	0.0	2	12.5	0	0.0

A right first distal foot phalanx from Grave 561 displays bone growth along the plantar aspect of the bone, from the distal to the proximal epiphysis, possibly reflecting osteoarthritic change (Figure 3.240). Only right first distal foot phalanges were recovered (Table 3.319). As the diaphysis of the first distal foot phalanx displays pathology, none of the epiphyses are recorded with evidence of pathology (Table 3.320).

Figure 3.240: Right distal first foot phalanx from Grave 561 with bone growth along the plantar aspect indicated (plantar view, distal is up).

Table 3.319: Percentage of adult first distal foot phalanges with pathology by side[74] from Kissonerga-*Mosphilia*

Pathology	Left	Right	Total
No pathology	0	1	1
OA observed Percent with OA	0 0.0	1 50.0	1 50.0
Total	0	2	2

Table 3.320: Percentage of proximal and distal epiphyses of the distal foot phalanges with pathology from Kissonerga-*Mosphilia*

Phalanx	Proximal Epiphyses	PE with pathology	Percent	Distal Epiphyses	DE with pathology	Percent
Distal First	2	0	0.0	2	0	0.0
Distal (2-5)	7	1	14.3	7	0	0.0

Two distal foot phalanges (digits two through five) display possible evidence of trauma or congenital defect (Table 3.318). A distal foot phalanx from Grave 505 displays a small osteophyte projecting from the side of the diaphysis just proximally of the distal epiphysis. A distal foot phalanx from Grave 506 is ankylosed proximally to the intermediate phalanx (see Figure 3.53 above). There is no evidence of infection, metabolic disorder or infectious or hematopoietic disease on any of the distal foot phalanges at Kissonerga-*Mosphilia*.

3.2.26.3.4 Comparison

There is no statistically significant difference in pathological expression on the adult distal first foot phalanx across the three sites (Chi Squared p=0.576). As well, there is no statistically significant difference in pathological expression based on side for the distal first phalanges across the three sites (Chi Squared p=0.620). Nor is there any statistically significant difference in pathologies observed on the distal foot phalanges for digits two through five across the three sites (Chi Squared p=0.498). Osteoarthritic changes and possible incidences of trauma were the only pathologies observed on the distal foot phalanges. These typically occur as osteophytic growth on the proximal or distal epiphyses with bone growth extending down the diaphysis or as a general thickening and altered morphology of the diaphysis. Overall, there are very few distal foot phalanges recovered from the settlement sites.

[74] The calculations within this table do not include the first proximal foot phalanges which could not be assessed for pathology.

3.2.27 Miscellaneous Bones

3.2.27.1 Hyoid

No pathologies were observed on any of the hyoids despite fairly good surface preservation and fragmentation levels (Table 3.321).

Table 3.321: Percentage of hyoid bones examined from each site

Site	**Count**	**Percent**	**Count of subadult**	**Percent**	**Count of CBA for pathology**	**Percent**	**Count with pathology**
Souskiou-*Laona*	12	60.0	0	0.0	1	8.3	0
Lemba-*Lakkous*	1	5.0	0	0.0	0	0.0	0
Kissonerga-*Mosphilia*	7	35.0	1	14.3	1	14.3	0
Total	20	100.0	1	5.0	2	10.0	0

3.2.27.2 Sesamoid Bones

There were no pathologies observed on the sesamoids (Table 3.322). The sesamoids are for the most part, very complete with low levels of fragmentation. Surface preservation levels varied across the sites, however, the majority are described as chalky or with some taphonomic damage. Since so much of the material is commingled and disarticulated it was in many cases impossible to determine where in the body the sesamoid was from.

Table 3.322: Percentage of sesamoid bones examined from each site

Site	**Count**	**Percent**	**Count of subadult**	**Percent**	**Count of CBA for pathology**	**Percent**	**Count with pathology**
Souskiou-*Laona*	22	74.2	0	0.0	0	0.0	0
Lemba-*Lakkous*	1	3.2	0	0.0	0	0.0	0
Kissonerga-*Mosphilia*	7	22.6	0	0.0	1	14.3	0
Total	31	100.0	0	0.0	1	3.2	0

3.2.27.3 Indeterminate Phalanges

Indeterminate phalanges represent all the phalanges which could not be attributed to either the hand or the foot based on their high levels of fragmentation resulting in incompleteness and/or very poor preservation levels (Table 3.323).

Table 3.323: Percentage of indeterminate phalanges examined from each site

Site	**Count**	**Percent**	**Count of subadult**	**Percent**	**Count of CBA for pathology**	**Percent**	**Count with pathology**
Souskiou-*Laona*	31	66.0	4	12.9	25	80.6	0
Lemba-*Lakkous*	1	2.1	0	0.0	1	100.0	0
Kissonerga-*Mosphilia*	15	31.9	14	93.3	1	6.7	0
Total	47	100.0	18	38.3	27	57.4	0

3.2.27.4 Indeterminate Bone

As completeness, fragmentation and surface preservation all tended to be issues for the material on Cyprus, on many occasions no further identification was achieved beyond labelling fragments as indeterminate bone or belonging to a long bone. These groupings of 'indeterminate long bone' can contain from one to multiple individual long bones and as such are not able to be quantified in any usable manner. These bones are highly fragmentary with 95.5% less than 25% complete, and 88.2% with no recognizable fragments. Surface preservation varies across the sites with the majority falling into the moderate to poor categories. Overall, 90.1% of all this material could not be assessed for pathological lesions.

3.2.28 Overall Conclusions based on Bone Element Analysis

The table (3.324) below provides a synopsis of the bones affected with a particular pathology and the general percentage of that particular bone or tooth group affected by the pathology. While the quantitative analysis is important for establishing differences in frequency, it seems that there is value to qualitatively examine the types of pathologies affecting the bones at the three sites and to discuss these in terms of severity of expression.

Table 3.324: Percentage of Adult bones affected with pathology across the three sites[75]

Pathology	**Bone/Tooth Element**	**Souskiou-*Laona***	**Lemba-*Lakkous***	**Kissonerga-*Mosphilia***	**Statistically significant difference**
Osteoarthritic changes	Atlas	6.5%	40.0%	0.0%	No
	Axis	20.3%	44.4%	27.3%	No
	Thoracic Vertebrae	21.7%	17.9%	5.1%	No
	Lumbar Vertebra	24.1%	0.0%	14.3%	No
	1st Rib	2.0%	0.0%	16.7%	No
	Sternum	7.1%	0.0%	0.0%	No
	Scapula	4.7% glenoid and acromion	20.0% glenoid and acromion	5.0% acromion and coracoid	Yes – b/t LL & SL and LL & KM
	Clavicle	1.4%	18.8%	0.0%	Yes – b/t LL & SL and LL & KM
	Humerus	3.5% - DE	5.9% - DE	0.0%	No
	Radius	6.1% - PE	21.4% - PE	0.0%	No
	Ulna	3.9% - PE	0.0%	6.3% - DE	No
	Carpals	4.9% Hamate	9.1% Capitate	2.2% Trapezoid	No
	Metacarpals	2.8% - MCI	0.0%	1.1% - MCI	Yes – b/t SL & KM
	Hand Phalanges	Prox 1st – 6.7% Prox – 0.0% Inter – 0.4% Dist 1st – 3.8% Dist – 4.9%	Prox 1st – 0.0% Prox – 0.0% Inter – 0.0% Dist 1st – 0.0% Dist – 0.0%	Prox 1st – 0.0% Prox – 0.0% Inter – 0.0% Dist 1st – 12.5% Dist – 0.0%	No
	Os Coxae	3.2%	0.0%	0.0%	No
	Femur	2.6% - PE	0.0%	0.0%	No
	Patella	9.2%	0.0%	0.0%	No
	Tibia	1.2% - PE	0.0%	0.0%	No
	Fibula	0.9% - DE	0.0%	0.0%	No
	Tarsals	4.3% Navicular	0.0%	1.6% Navicular	No
	Metatarsals	2.1% - MTV	0.0%	5.2% - MTI & MTV	No
	Foot Phalanges	Prox 1st – 13.0% Prox – 8.2% Inter – 15.8% Dist 1st – 46.7% Dist – 23.6%	Prox 1st – 16.7% Prox – 5.6% Inter – 0.0% Dist 1st – 0.0% Dist – 0.0%	Prox 1st – 10.0% Prox – 8.3% Inter – 22.2% Dist 1st – 33.3% Dist – 0.0%111	No
Trauma	Cranium – Parietal	0.8%	0.0%	0.0%	No
	Radius	1.2%	0.0%	0.0%	No
	Metacarpals	1.1% - MCI	0.0%	0.0%	No
	Hand Phalanges	Prox 1st – 0.0% Prox – 0.5% Inter – 0.7% Dist 1st – 0.0% Dist – 0.0%	Prox 1st – 0.0% Prox – 0.0% Inter – 0.0% Dist 1st – 0.0% Dist – 3.3%	Prox 1st – 0.0% Prox – 0.0% Inter – 0.0% Dist 1st – 0.0% Dist – 0.0%	No

[75] Where there is a particular bone or part of bone listed within the chart, this refers to the bone with the highest percentage of pathology observed.

Pathology	Bone/Tooth Element	Souskiou-*Laona*	Lemba-*Lakkous*	Kissonerga-*Mosphilia*	Statistically significant difference
Trauma	Tibia	1.2%	8.3%	0.0%	No
	Fibula	1.8%	0.0%	0.0%	No
	Metatarsals	1.6% - MTV & MTI	0.0%	0.0%	No
	Foot Phalanges	Prox 1st – 3.8% Prox – 4.1% Inter – 2.3% Dist 1st – 3.3% Dist – 1.8%	Prox 1st – 0.0% Prox – 0.0% Inter – 0.0% Dist 1st – 0.0% Dist – 0.0%	Prox 1st – 0.0% Prox – 2.1% Inter – 0.0% Dist 1st – 0.0% Dist – 28.6%	No
Congenital Defects	Sacrum	12.9%	0.0%	0.0%	No
Infection	Maxilla	2.2%	0.0%	10.0%	No
	Frontal	0.0%	7.7%	0.0%	No
	Mandible	0.0%	0.0%	10.5%	No
	Sacra	3.2%	0.0%	0.0%	No
	Radius	0.5%	0.0%	0.0%	No
	Hand Phalanges	Prox 1st – 0.0% Prox – 0.5% Inter – 0.0% Dist 1st – 0.0% Dist – 0.0%	Prox 1st – 0.0% Prox – 0.0% Inter – 0.0% Dist 1st – 0.0% Dist – 0.0%	Prox 1st – 0.0% Prox – 0.0% Inter – 0.0% Dist 1st – 0.0% Dist – 0.0%	No
Metabolic Disorder/ Infectious Disease/ Hematopoietic Disease	Frontal	2.0%	7.7%	0.0%	Yes – b/t SL & LL
	Sphenoid	0.0%	10.0%	0.0%	No
	Femur	0.9%	0.0%	0.0%	No
	Tibia	0.0%	8.3%	0.0%	No
AMTL	Maxilla	9.7% - avg tooth loss = 2.1/max	10.0% - avg tooth loss = 1.0/max	5.0% - avg tooth loss = 8.0/max	No
	Mandible	12.8% - avg tooth loss = 1.4/man	30.7% - avg tooth loss = 2.5/man	15.8% - avg tooth loss = 2.7/man	No
Calculus	% max	10.7%	5.4%	19.4%	Yes – b/t LL & SL and LL and KM
	% man	12.5%	7.3%	15.2%	
	Tooth type[76]	Central Incisor	Third Molar	Third Molar	
Caries	% max	5.2%	3.8%	1.2%	Yes – b/t KM & SL and KM and LL
	% man	3.5%	9.0%	0.6%	
	Tooth type	Second Molar	Second Molar	Second Molar	
LEH	% max	3.2%	2.2%	5.3%	Yes – b/t SL & KM
	% man	1.7%	3.0%	6.4%	
	Tooth type	Canine	Canine	Canine	
Attrition	% max	6.8%	8.1%	3.6%	Yes – b/t KM & LL and KM & SL
	% man	3.3%	7.2%	3.2%	
	Tooth type	First Molar	Second Premolar	Canines	
Alveolar Resorption	Maxilla	1.1%	0.0%	10.0%	No
	Mandible	1.2%	0.0%	0.0%	No

[76] Refers to the tooth type which displays the highest frequency of the pathology.

This examination of the bone elements as discrete variables provides a clearer understanding of pathological expression throughout the skeleton. Each skeletal element is affected with various pathologies in different proportions across the three sites. The differences in prevalence of pathology on the discrete skeletal elements will elucidate more about the activities and health issues affecting the living populations from which these skeletal samples are derived.

3.3 Pathological Analysis by Discrete Mortuary Feature

This section will now examine the prevalence and differences in pathologies by discrete mortuary feature, referring to the tombs and graves of the study sites. The differences in burial practice between the cemetery and settlement sites are highlighted by the average number of individuals per burial across the sites and the percentage of single inhumations at each site (Table 3.325 and Figure 3.241). The majority of the burials at the settlement sites are single inhumations while the tombs from Souskiou-*Laona* typically contain more than one individual. Table 3.326 presents the percentage of burials from each location, while Table 3.327 provides the basic demographic profile of the mortuary populations at each site, with the percentage of each age group or sex within the site in the bottom half of the table. The demographic breakdown of the three sites presents a statistically significant difference in the percentages of adults and subadults between the sites (Chi Squared p=0.000 and p=0.026 respectively). However, all three sites are relatively comparable in regards to the percentage of the population which has an estimated age of adolescent and for the split between males and females at each site.

Table 3.325: Frequency of multiple burials at all three sites

Site	**Souskiou-*Laona***		**Lemba-*Lakkous***		**Kissonerga-*Mosphilia***	
MNI/tomb	Count	Percent	Count	Percent	Count	Percent
1	4	14.8	40	85.1	49	79.0
2	3	11.1	5	10.6	9	14.5
3	5	18.5	1	2.1	3	4.8
4	2	7.4	1	2.1	1	1.6
5	5	18.5	0	0.0	0	0.0
6	1	3.7	0	0.0	0	0.0
7	2	7.4	0	0.0	0	0.0
8	1	3.7	0	0.0	0	0.0
9	3	11.1	0	0.0	0	0.0
12	1	3.7	0	0.0	0	0.0
Total	27	100.0	47	100.0	62	100.0

Figure 3.241: Percentage of discrete mortuary features by the Minimum Number of Individuals within them for all three sites

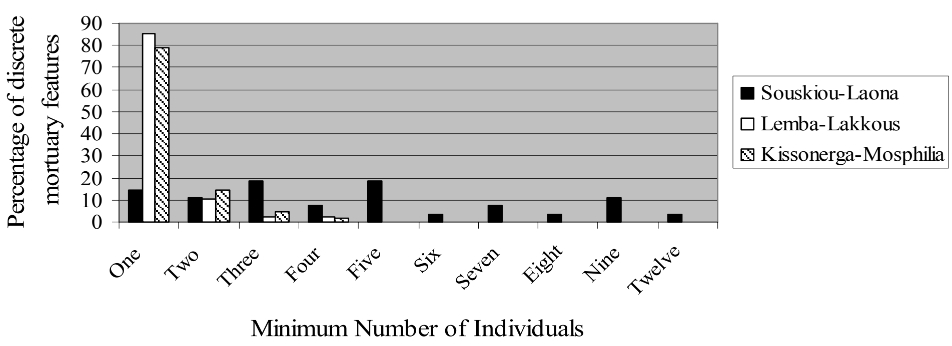


Table 3.326: Percentage of burials from each site

Site	Count	Percent
Souskiou-*Laona*	27	19.9
Lemba-*Lakkous*	47	34.6
Kissonerga-*Mosphilia*	62	45.5
Total	136	100.0

Table 3.327: Demographic profile of each site

	Souskiou-*Laona**	**Lemba-*Lakkous***	**Kissonerga-*Mosphilia****	**Total**
MNI % of MNI	125 47.5%	58 22.1%	80 30.4%	263 100.0%
No. of Mortuary Features % of Mortuary Features	27 19.9%	47 34.6%	62 45.6%	136 100.0%
Subadults % of Subadults	29 25.2%	37 32.2%	49 42.6%	115 100.0%
Adults % of Adults	84 67.2%	16 12.8%	25 20.0%	125 100.0%
Adolescents % of Adolescents	10 50.0%	5 25.0%	5 25.0%	20 100.0%
Males % of Males	23 71.9%	3 9.4%	6 18.8%	32 100.0%
Females % of Females	45 66.2%	10 14.7%	13 19.1%	68 100.0%
Percent of population within each site	**Souskiou-*Laona****	**Lemba-*Lakkous***	**Kissonerga-*Mosphilia****	**Total**
% of Subadults	23.6%	63.8%	62.0%	44.2%
% of Adults	68.3%	27.6%	31.7%	48.1%
% of Adolescents	8.1%	8.6%	6.3%	7.7%
Total	100.0%*	100.0%	100.0%*	100.0%
% of adults - males	27.4%	20%	24%	25.8%
% of adults - females	53.6%	66.7%	52%	54.8%

* The Souskiou-*Laona* sample contains two individuals where no age estimation is possible (T125), therefore the calculations of the percentage of each age group at the site includes only 123 individuals. The Kissonerga-*Mosphilia* sample contains one individual where no age estimation is possible (Grave 526), therefore the calculations of the percentage of each age group at the site includes only 79 individuals.

3.3.1 Souskiou-Laona

There is an average number of 4.6 individuals per tomb at Souskiou-*Laona* (Table 3.325). As presented above, the majority of the individuals are skeletally mature, with a small percentage of the population composed of subadult individuals. Dental caries are the most common pathology observed on the skeletal material from Souskiou-*Laona*, unsurprising as the recovery of teeth tends to be better than postcranial bones and dental caries can affect individuals of any age. Overall, osteoarthritic changes of the vertebrae and feet represent the most common postcranial pathology within the Souskiou-*Laona* tombs. Figures 3.242, 3.243 and 3.244 present plans of the Souskiou-*Laona* cemetery with the tombs highlighted based on pathological expression. These plans provide a visual representation of the distribution of dental disease, upper body osteoarthritic changes and lower body osteoarthritic changes throughout the cemetery. There does not appear to be any patterning or clustering of a particular pathology with fairly even distribution across the tombs examined. This would seemingly indicate that there is no correlation between lesions, or possibly activity leading to a particular pathology, and burial location, a point which will be addressed in the following chapter.

The skeletal material within several tombs seems to stand out with a greater prevalence of pathology observed. There is no statistically significant difference in the percentage of individuals within each tomb with a particular type of pathology amongst the tombs (Table 3.328 – bottom row presents the results of the Chi Squared tests). While Tomb 108 often presents the highest prevalence of pathology within the tombs, it only contains a minimum of two individuals, both of whom display some form of pathology. When the minimum number of individuals within each tomb is taken into account, Tombs 125, 158, 165, 192, 200, 220 and 228 are noteworthy for the large number of individuals within the tomb and the high prevalence of pathologies within each. Tombs 159, 201 and 207 are noted for having a large minimum number of individuals with relatively low prevalence of individuals displaying pathology. There does not seem to be a spatial relationship amongst the

Figure 3.242: Distribution of dental pathology across Souskiou-*Laona* Cemetery Operation C

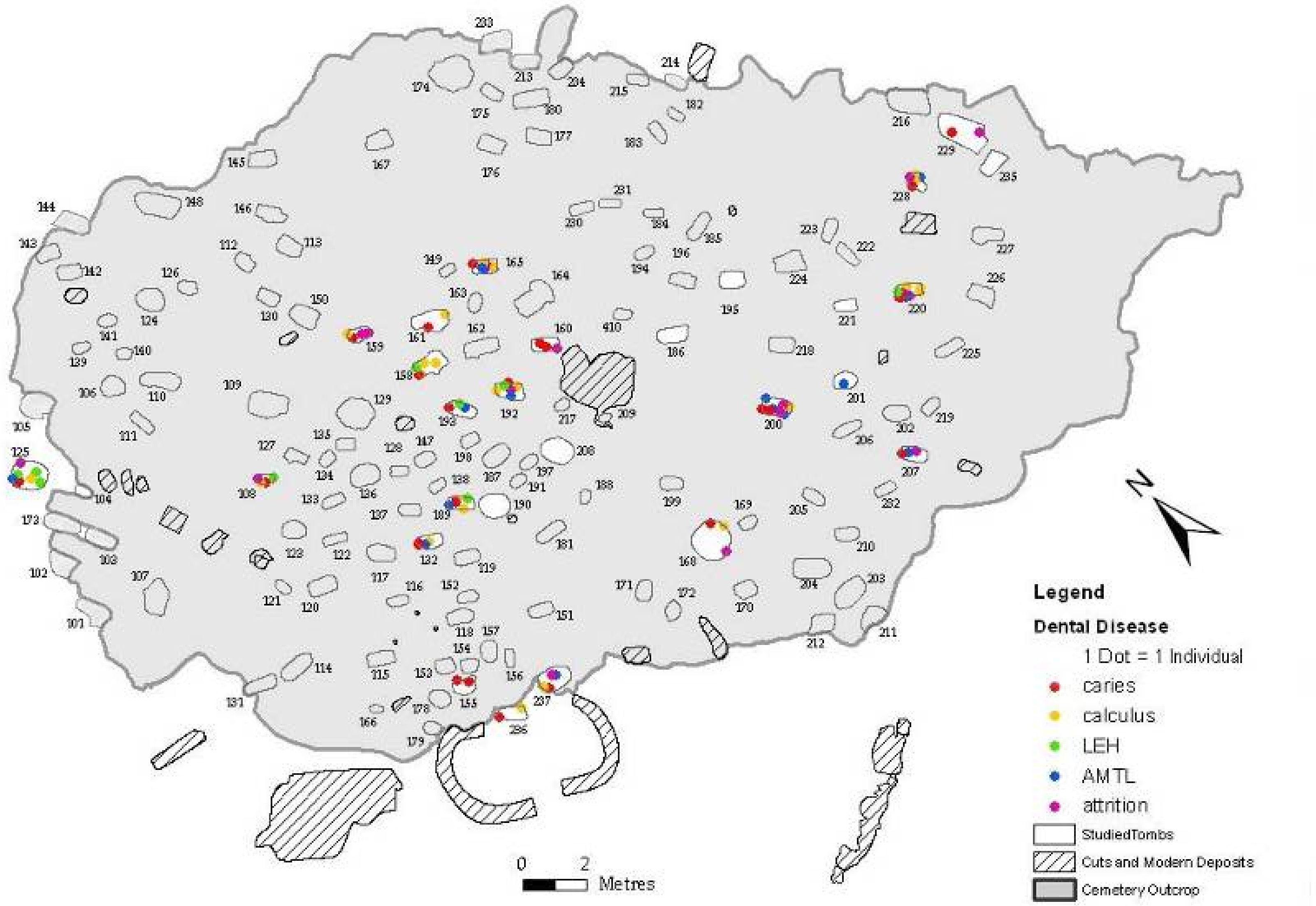


Figure 3.243: Distribution of Osteoarthritic changes on the upper body joints of individuals from Souskiou-*Laona* Cemetery Operation C

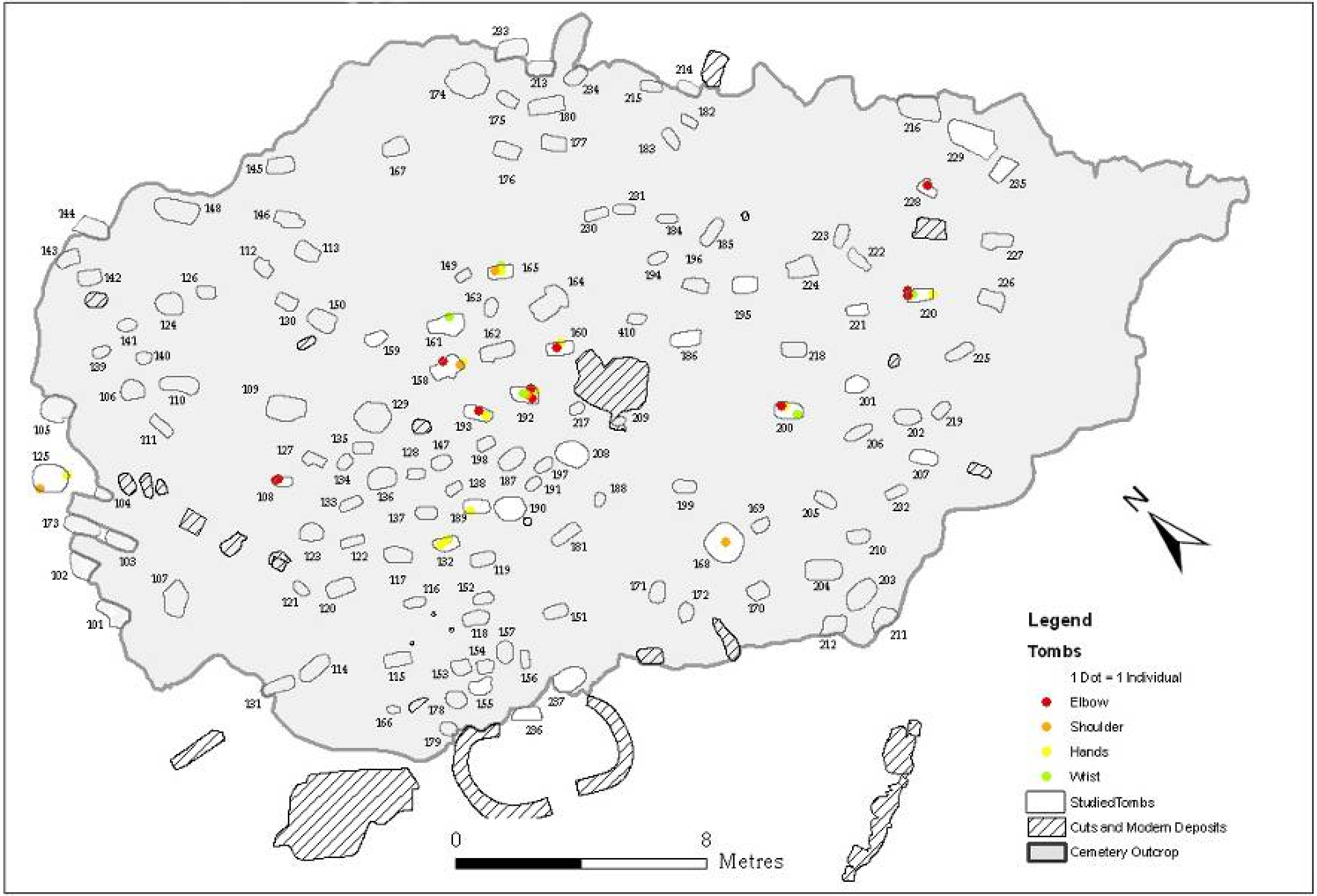
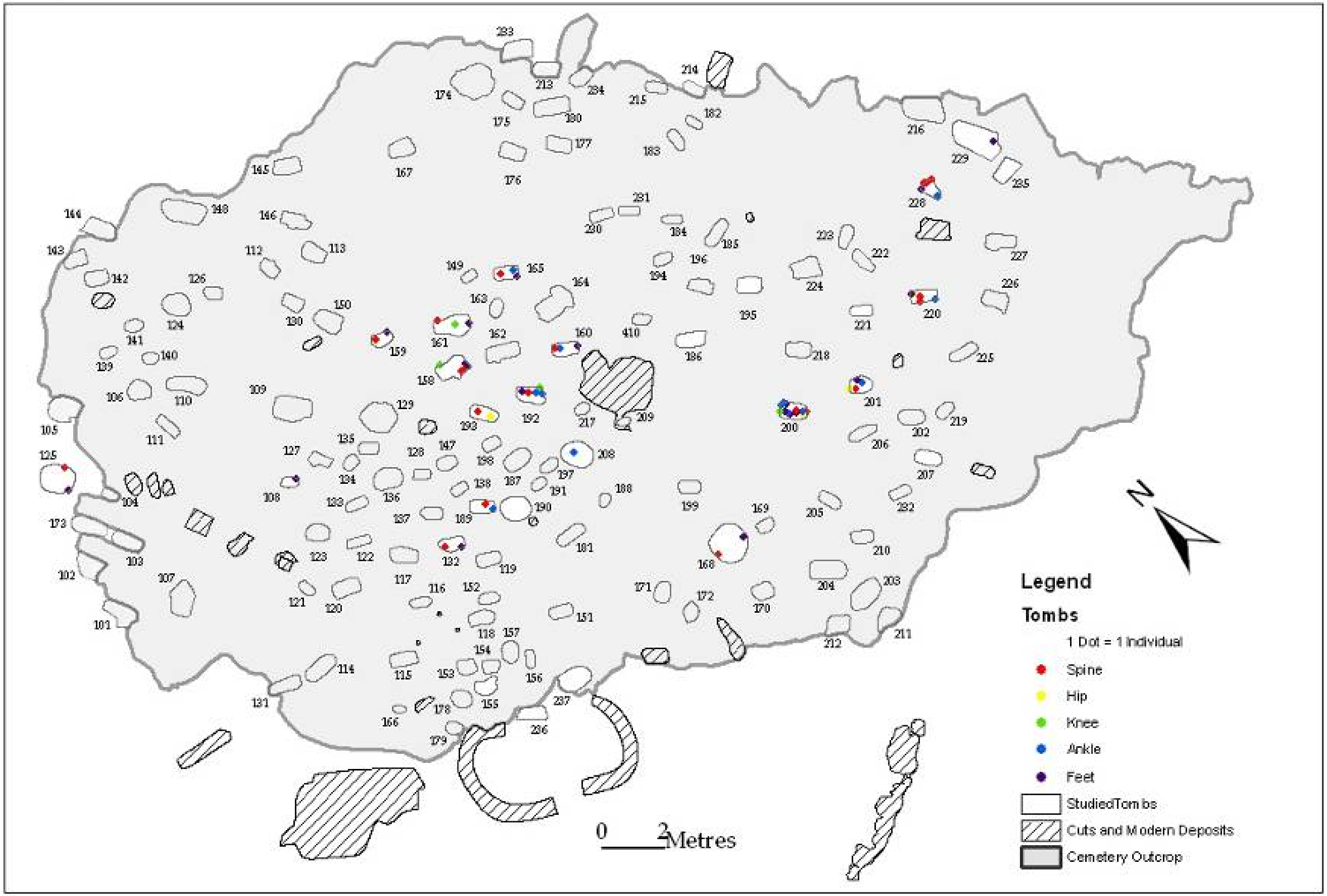


Figure 3.244: Distribution of Osteoarthritic Changes to the lower body joints of individuals from Souskiou-*Laona* Cemetery Operation C



tombs with higher prevalence of pathology and those with lower prevalence within the cemetery when these tombs are identified on the cemetery plans (Figures 3.242, 3.243 and 3.244).

Table 3.328: Percentage of individuals with a pathology within each tomb context with the highest prevalence of each pathology highlighted from Souskiou-*Laona*

Tomb Number	MNI	% with calculus	% with caries	% with LEH	% with AMTL	% with OA	% with trauma	% with disease
108	2	50.0	100.0	50.0	0.0	100.0	0.0	0.0
125	12	8.3	16.7	25.0	8.3	16.7	8.3	0.0
132	5	20.0	40.0	0.0	20.0	40.0	20.0	0.0
155	2	0.0	100.0	0.0	0.0	0.0	0.0	0.0
158	9	33.3	11.1	11.1	0.0	33.3	11.1	0.0
159	9	11.1	11.1	0.0	0.0	22.2	0.0	0.0
160	5	0.0	40.0	0.0	0.0	20.0	20.0	0.0
161	3	33.3	33.3	0.0	0.0	33.3	33.3	33.3
165	7	28.6	28.6	0.0	28.6	14.3	14.3	14.3
168	3	33.3	33.3	0.0	0.0	33.3	33.3	0.0
186	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
189	4	50.0	25.0	25.0	25.0	25.0	0.0	25.0
190	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
192	9	33.3	11.1	11.1	11.1	22.2	11.1	0.0
193	3	0.0	33.3	33.3	33.3	33.3	0.0	0.0
195	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200	5	40.0	40.0	0.0	60.0	80.0	40.0	0.0
201	5	0.0	0.0	0.0	20.0	20.0	20.0	0.0
207	8	0.0	12.5	0.0	12.5	0.0	0.0	0.0
208	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0
220	7	42.9	28.6	14.3	28.6	28.6	14.3	0.0
221	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
228	6	33.3	16.7	0.0	33.3	50.0	16.7	0.0
229	4	0.0	25.0	0.0	0.0	25.0	0.0	0.0
235	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
236	1	100.0	100.0	0.0	0.0	0.0	0.0	0.0
237	5	20.0	20.0	0.0	20.0	0.0	0.0.	0.0
Totals	*125*	*20.0*	*22.4*	*7.2*	*13.6*	*24.8*	*10.4*	*2.4*
Chi Squared p=		0.329	0.329	0.364	0.337	0.315	0.346	0.386

3.3.1.1 Dental Disease

Dental pathologies are the most frequently observed type of pathology on a tomb-by-tomb basis at Souskiou-*Laona*. The minimum number of individuals within a tomb with a particular pathology was determined based on the location within the dental arc of the tooth which displays the pathology or by dental development. Of the 27 tombs examined, 74.1% (n=20) contain at least one individual who displays some form of pathology on the teeth. As Table 3.329 presents, caries are the most frequently observed dental pathology amongst the individuals at Souskiou-*Laona* and are observed in the greatest number of tombs.

Table 3.329: Percentage of tombs with at least one individual displaying dental pathology and percentage of the MNI of the total mortuary population examined

Pathology	**Minimum number of tombs with at least one individual with pathology**	**% of tombs with pathology**	**Number of tombs/MNI with dental pathology**	**MNI affected**	**% of total individuals**
Calculus	15	55.6	8 tombs with 1 individual 4 tombs with 2 individuals 3 tombs with 3 individuals	25	20.0
Caries	20	74.1	12 tombs with 1 individual 8 tombs with 2 individuals	28	22.4
LEH	7	25.9	6 tombs with 1 individual 1 tomb with 3 individuals	9	7.2
AMTL	12	44.4	8 tombs with 1 individual 3 tombs with 2 individuals 1 tomb with 3 individuals	17	13.6
Attrition	13	48.1	10 tombs with 1 individual 2 tombs with 2 individuals 1 tomb with 3 individuals	17	13.6

Several tombs contain a minimum of three individuals with a particular dental pathology. At least three individuals from Tomb 125 display LEH on at least one tooth; three individuals from Tombs 158, 192 and 220 display calculus on at least one tooth; and finally at least three individuals from Tomb 200 display ante-mortem tooth loss and heavy attrition[77]. The grouping of a particular dental pathology within a tomb may reflect similarities in diet, oral hygiene, food preparation practices, etc… which may lead to a better understanding of the nature of the relationships of those buried within the same tomb. Spatially, these tombs do not seem to be clumped or spaced in a particular way around the cemetery. Further discussion of the possible interpretations regarding the distribution of dental pathologies amongst the tombs are in the following chapter.

[77] More information about the pathologies in each tomb can be found in Appendix E.

3.3.1.2 Osteoarthritic Changes

Table 3.330 presents the percentage of tombs with at least one individual displaying osteoarthritic changes to a particular joint. As the table indicates, most tombs contain only one individual with a particular joint affected by osteoarthritic changes. As discussed above, due to the fragmentation and number of the ribs and vertebrae within the body and the commingling of material, the only way to accurately discuss pathologies of these bone groups at Souskiou-*Laona* is by tomb.

Table 3.330: Percentage of tombs with at least one individual with osteoarthritic changes to a particular joint and the percentage of individuals overall affected from Souskiou-*Laona*

Joint	**Minimum number of tombs with at least one individual with OA**	**% of tombs**	**Number of tombs/MNI with OA**	**Total Individuals**	**% of total individuals**
Vertebrae	15	55.6	10 tombs with 1 individual 4 tombs with 2 individuals 1 tomb with 3 individuals	21	16.8
Feet	15	55.6	13 tombs with 1 individual 1 tomb with 2 individuals 1 tomb with 4 individuals	19	15.2
Ankle	10	37.0	7 tombs with 1 individual 2 tombs with 2 individuals 1 tomb with 4 individuals	15	12.0
Hand	10	37.0	9 tombs with 1 individual 1 tomb with 2 individuals	11	8.8
Elbow	8	29.6	5 tombs with 1 individual 3 tombs with 2 individuals	11	8.8
Wrist	6	22.2	6 tombs with 1 individual	6	4.8
Shoulder	5	18.5	5 tombs with 1 individual	5	4.0
Ribs	4	14.8	4 tombs with 1 individual	4	3.2
Hip	4	14.8	4 tombs with 1 individual	4	3.2
Knee	4	14.8	4 tombs with 1 individual	4	3.2

There are higher percentages of tombs containing at least one individual with osteoarthritic changes to the vertebrae and feet than the other joints. Where there is more than one individual affected within a tomb, it reflects osteoarthritic changes to the same vertebra, mainly the first or second cervical vertebra, as they are the most readily identifiable and limited to one per individual. It is difficult to assess the minimum number of individuals within the sample which have vertebrae present. The mortuary practices at Souskiou-*Laona* seem to move the bones around within the tombs without removing any from the tomb context (Farnaby 2007). Therefore, if there are at least 125 individuals present based on the MNI from each tomb, the assumption could be made that, at least initially, there were 125 vertebral columns present. If this assumption is correct than 16.8% of the overall mortuary sample from Souskiou-*Laona* display osteoarthritic changes to the vertebrae. As this includes subadults, and there is no evidence of osteoarthritic changes of the vertebrae within the subadult mortuary sample, when the subadult sample is removed, 21.9% of the adult sample display osteoarthritic changes to the vertebrae.

The ribs are particularly difficult to associate with a discrete individual. Based on this and the level of fragmentation of the ribs within the Souskiou-*Laona* tombs, all that can be conclusively said about pathological expression on the ribs is that there are four tombs which contain at least one individual with at least one rib displaying an osteoarthritic change to the articular facet.

Tomb 200 stands out amongst the Souskiou-*Laona* tombs, in regards to the minimum number of individuals with evidence of osteoarthritic changes, as four individuals within that tomb display lesions to at least one joint. Osteoarthritic changes are the most ubiquitous pathology across the tombs at Souskiou-*Laona*, with at least one individual displaying degenerative lesions in 66.7% (n=18) of the 27 tombs examined. In general, the distribution of osteoarthritic changes amongst the tombs indicates that burial location and degenerative pathology are not exclusive to any given area or group of individuals within the cemetery. Further discussion on the distribution of osteoarthritic changes amongst the population follows in Chapter 4.

3.3.1.3 Trauma

The prevalence of trauma observed on the bones based on the MNI is fairly low, however, it is fairly evenly distributed across the tombs at Souskiou-*Laona* (Table 3.328 above). Trauma was observed on 13 individuals from at least 12 tombs (44.4% of tombs). Tomb 200 once again stands out as the only tomb to contain more than one individual with evidence of trauma. The distribution of trauma across the cemetery once again seems to indicate that there is no correlation between evidence of pathology and burial location within this skeletal sample.

3.3.1.4 Disease or Disorder or other pathological lesions

Evidence of a disease, disorder or deficiency of a non-specific aetiology, in the form of porosity within the frontal orbits, on the calvarium or a general porosity or cortical thinning of the long bones, was recorded on individuals for only three individuals from three tombs (11.1% of the tombs). The low prevalence of evidence for disease or disorder amongst the population makes it difficult to discuss distribution throughout the cemetery. Since all three cases occur in different tombs, it seems unlikely that there is any correlation between burial location within the cemetery and individuals who may have suffered from a chronic disease.

Six tombs (22.2%) contain at least one individual who display some other form of pathological change which does not fall into one of the above categories, see the tomb discussions for more detail[78].

3.3.2 Lemba-*Lakkous*

There is an average number of 1.2 individuals per grave at Lemba-*Lakkous* (Table 3.325 above). The majority of the individuals from Lemba-*Lakkous* are subadults representing 63.9% of the population (Table 3.327). Of this subadult group, most are children aged between 3-11 years at death. This will have an obvious effect on the percentage of overall individuals affected with osteoarthritic changes as most are due to degenerative responses to use which accumulate with age. Discussion of the prevalence of individuals with a particular pathology within a grave is not particularly relevant as there are rarely multiple individuals within a grave. A preliminary analysis was conducted to identify any patterns in the distribution of pathologies based on burial location within the site. It was determined that there did not appear to be any pattern, rather, the distribution of pathologies was correlated to the location of adult skeletons which were scattered in no apparent specific plan throughout the site (both area one and area two) and the levels of preservation within each grave. Based on these results, it was decided not to pursue any further the distribution of pathologies based on grave location in the settlement sites. There are several graves (Graves 25, 26, 30 and 50 in particular) with adult individuals which appear to display a greater number of pathologies. Dental caries are the most common pathology observed on the

[78] Tombs: 155, 165, 168, 192, 220, 228.

skeletal material from *Lemba-Lakkous*. Overall, osteoarthritic changes of the vertebrae represent the most common postcranial pathology within the Lemba-*Lakkous* graves.

3.3.2.1 Dental Disease

Dental pathologies represent the most frequently occurring pathology on a grave-by-grave basis from Lemba-*Lakkous*. Of the 47 graves examined, 31.9% (n=15) contain at least one individual with at least one tooth which displays a pathology. As Table 3.331 presents, caries are the most frequently observed dental pathology amongst the individuals at Lemba-*Lakkous* and are observed in the greatest number of tombs.

Table 3.331: Percentage of graves with at least one individual displaying dental pathology and percentage of the MNI of the total mortuary population examined from Lemba-*Lakkous*

Pathology	**Minimum number of graves with at least one individual with pathology**	**% of graves with pathology**	**Number of graves/MNI with dental pathology**	**MNI affected**	**% of total individuals**
Calculus	8	17.0	8 tombs with 1 individual	8	13.8
Caries	14	29.8	14 tombs with 1 individual	14	24.1
LEH	4	8.5	4 tombs with 1 individual	4	6.9
AMTL	6	12.8	6 tombs with 1 individual	6	10.3
Attrition	6	12.8	6 tombs with 1 individual	6	10.3

3.3.2.2 Osteoarthritic Changes

Osteoarthritic changes are the second most frequently observed pathological change observed on a grave-by-grave basis. Table 3.332 presents the percentage of tombs with at least one individual displaying osteoarthritic changes to a particular joint. As the table indicates, all the tombs contain only one individual with a particular joint affected by osteoarthritic changes. As discussed above, due to the fragmentation of the ribs and vertebrae and the number of each bone group within the body, the only way to accurately discuss pathologies of these bones at Lemba-*Lakkous* is by grave.

Table 3.332: Percentage of graves with at least one individual with osteoarthritic changes to a particular joint and the percentage of individuals overall affected from Lemba-*Lakkous*

Joint	**Minimum number of graves with at least one individual with OA**	**% of graves**	**Number of graves/MNI with osteoarthritic changes**	**Total Individuals**	**% of total individuals**
Vertebrae	9	19.1	9 graves with 1 individual	9	15.5
Feet	3	6.4	3 graves with 1 individual	3	5.2
Ankle	0	0.0	0 graves	0	0.0
Hand	1	2.1	1 grave with 1 individual	1	1.7
Elbow	2	4.3	2 graves with 1 individual	2	3.4
Wrist	2	4.3	2 graves with 1 individual	2	3.4
Shoulder	2	4.3	2 graves with 1 individual	2	3.4
Ribs	1	2.1	1 grave with 1 individual	1	1.7
Hip	0	0.0	0 graves	0	0.0
Knee	0	0.0	0 graves	0	0.0

Overall, 21.3% (n=10) of the 47 graves studied contain at least one individual who displays at least some form of osteoarthritic change to at least one joint. It is difficult to assess the number of individuals within the sample which have vertebrae present. Given the mortuary practices at Lemba-*Lakkous*, which seem to move the bones around both within the graves and amongst the graves, it impossible to determine how many spinal columns were present initially within this mortuary sample. All that can be stated based on this analysis is that there are nine individuals with osteoarthritic changes to the vertebrae, none of which are subadults[79].

In regards to osteoarthritic changes to the ribs, one of the 47 graves studied (2.1%) contain at least one individual with osteoarthritic changes to at least one rib. Based on the level of fragmentation of the ribs within the Lemba-*Lakkous* graves, all that can be conclusively said about pathological expression on the ribs is that there is at least one individual with at least one rib which displays osteophytic growth to the articular facet.

[79] More detailed results, based on the presence or absence of a particular body part, are available in the individuals section of the Results chapter.

3.3.2.3 Trauma

There is only minimal evidence of possible minor trauma on the skeletal material derived from Lemba-*Lakkous.* Trauma was observed on a minimum of two individuals (3.4% of mortuary population) from at least two graves (4.3% of graves).

3.3.2.4 Disease or Disorder or other pathological lesions

Evidence of a disease, disorder or deficiency of a non-specific aetiology, in the form of porosity within the frontal orbits, on the calvarium or a general porosity or cortical thinning of the long bones, is recorded on at least six (10.3% of mortuary population) individuals from six graves (12.8% of graves).

Three graves (6.4%) contain at least one individual who displays some other form of pathological change which does not fall into one of the above categories, see the tomb discussions for more detail[80].

3.3.3 Kissonerga-Mosphilia

There is an average number of 1.3 individuals per grave at Kissonerga-*Mosphilia* (Table 3.325 above). The majority of the individuals from Kissonerga-*Mosphilia* are subadults, representing 58.3% of the mortuary population (Table 3.327). Of this subadult group, most are infants aged between prenatal to two years at death. This will have an obvious effect on the percentage of overall individuals affected with osteoarthritic changes as most are due to degenerative responses to use which accumulate with age. Discussion of the prevalence of individuals with a particular pathology within a grave is not particularly relevant as there are rarely multiple individuals within a grave. A preliminary analysis was conducted to identify any patterns in the distribution of pathologies based on burial location within the site. It was determined that there did not appear to be any pattern, rather, the distribution of pathologies was correlated to the location of adult skeletons which were scattered in no apparent specific plan throughout the site depending on the specific Kissonerga-*Mosphilia* chronological period and the percentage of the skeleton present. Again, based on these results, it was decided not to pursue any further the distribution of pathologies based on grave location in the settlement sites. Calculus accumulation on

[80] Graves: 30, 34, 46.

the teeth is the most common pathology observed on the skeletal material from Kissonerga-*Mosphilia*. Overall, osteoarthritic changes of the feet represent the most common postcranial pathology within the Kissonerga-*Mosphilia* graves.

3.3.3.1 Dental Disease

Dental pathologies represent the most frequently occurring pathology on a grave-by-grave basis from Kissonerga-*Mosphilia*. Of the 62 graves examined from Kissonerga-*Mosphilia,* 29.0% (n=18) contain at least one individual with at least on tooth which displays a pathology. The minimum number of individuals within a tomb with a particular pathology was determined based on the location within the dental arc of the tooth which displays the pathology or by dental development. As Table 3.333 presents, calculus is the most frequently observed pathology amongst the individuals and amongst the graves at Kissonerga-*Mosphilia*

Table 3.333: Percentage of tombs with at least one individual displaying dental pathology and percentage of the MNI of the total mortuary population examined from Kissonerga-*Mosphilia*

Pathology	**Minimum number of graves with at least one individual with pathology**	**% of graves with pathology**	**Number of graves/MNI with dental pathology**	**MNI affected**	**% of total individuals**
Calculus	14	22.6	10 graves with 1 individual 4 graves with 2 individuals	18	22.5
Caries	4	6.5	3 graves with 1 individual 1 grave with 2 individuals	5	6.3
LEH	11	17.7	10 graves with 1 individual 1 grave with 2 individuals	12	15.0
AMTL	2	3.2	2 graves with 1 individual	2	2.5
Attrition	7	11.3	7 graves with 1 individual	7	8.8

3.3.3.2 Osteoarthritic Changes

Osteoarthritic changes are the most frequently observed postcranial pathological change observed on a grave-by-grave basis, observed in 14.5% (n=9) of the graves examined. Table 3.334 presents the percentage of graves with at least one individual displaying osteoarthritic changes to a particular joint. As the table indicates, all the tombs contain only one individual with a particular joint affected by osteoarthritic changes. As discussed above, due to the fragmentation of the ribs and vertebrae and the number of each bone group within the body, the only way to accurately discuss pathologies of these bones at Kissonerga-*Mosphilia* is by grave.

Table 3.334: Percentage of graves with at least one individual with osteoarthritic changes to a particular joint and the percentage of individuals overall affected from Kissonerga-*Mosphilia*

Joint	**Minimum number of graves with at least one individual with OA**	**% of graves**	**Number of graves/MNI with OA**	**Total Individuals**	**% of total individuals**
Vertebrae	4	6.5	4 graves with 1 individual	4	5.0
Feet	6	9.7	6 graves with 1 individual	6	7.5
Ankle	1	1.6	1 grave with 1 individual	1	1.3
Hand	1	1.6	1 grave with 1 individual	1	1.3
Elbow	1	1.6	1 grave with 1 individual	1	1.3
Wrist	1	1.6	1 grave with 1 individual	1	1.3
Shoulder	1	1.6	1 grave with 1 individual	1	1.3
Ribs	2	3.2	2 graves with 1 individual	2	2.5
Hip	0	0.0	0 graves	0	0.0
Knee	0	0.0	0 graves	0	0.0

Four (6.5%) of the graves contain at least one individual who displays osteoarthritic changes to at least one vertebra or vertebral group. At least four individuals from the Kissonerga-*Mosphilia* skeletal collection display osteoarthritic changes to the vertebrae. It is difficult to assess the minimum number of individuals within the sample which have vertebrae present. Given the mortuary practices at Kissonerga-*Mosphilia*, which are highly variable and there is the possibility of movement of remains amongst the graves, it impossible to determine how many spinal columns were initially present within this mortuary population sample. All that can be conclusively stated then is that there are four individuals with osteoarthritic changes to the vertebrae, none of which are subadults.

In regards to osteoarthritic changes to the ribs, two graves (3.2%) of the graves studied contain at least one individual with osteoarthritic changes to at least one rib. Based on the level of fragmentation of the ribs within the Kissonerga-*Mosphilia* graves, all that can be conclusively said about pathological expression on the ribs is that there are two graves where at least one individual has at least one rib which displays osteophytic growth on the articular facet.

3.3.3.3 Trauma

There is very little evidence of minor trauma on the skeletal material derived from Kissonerga-*Mosphilia.* Trauma was observed on a minimum of one individual (1.3% of the mortuary population) from at least one grave (4.3% of graves).

3.3.3.4 Disease or Disorder or other pathological lesions

Evidence of a disease, disorder or deficiency, of a non-specific aetiology, in the form of porosity within the frontal orbits, on the calvarium or a general porosity or cortical thinning of the long bones, is recorded on at least six individuals (7.5% of the mortuary population) from six graves (9.7% of graves).

Seven graves (11.3%) contain at least one individual who displays some other form of pathological change which does not fall into one of the above categories, see the tomb discussions for more detail.[81]

3.3.4 Comparison of mortuary feature data from all three sites

There is a statistically significant difference between the number of expected individuals within each burial complex between the cemetery and the settlement sites (Oneway ANOVA p=0.000 between Souskiou-*Laona* and the settlement sites). The tombs at Souskiou-*Laona* contain, on average, four times more the number of individuals than the settlement sites per mortuary feature. This difference in the minimum number of individuals per mortuary feature, will have an obvious effect on the minimum number of individuals within each burial who display a pathology and the number of skeletal elements displaying a lesion. Therefore, it is perhaps not appropriate to compare the number of pathologies per burial as it will be inherently skewed.

The percentage of tombs with at least one individual with a particular pathology (Table 3.335) and the overall frequency of pathologies within the population based on the minimum number of individuals can be compared amongst the three sites. The higher prevalence of tombs with at least one individual with a particular pathology at

[81] Graves: 505, 539, 546, 561, 563, 571, 574.

Souskiou-*Laona* is due to the low number of tombs and the large skeletal sample within. While the calculations of the minimum number of individuals with pathology is somewhat theoretical in practice as there are no complete skeletons due to preservation, recovery and burial practices, it is useful for comparison between the sites for basic expected percentages of pathological expression. Therefore, the percentage of the minimum number of individuals with each type of pathology is compared amongst the sites in the sections below.

Table 3.335: Percentage of burials from each site which contain at least one individual with the listed pathology

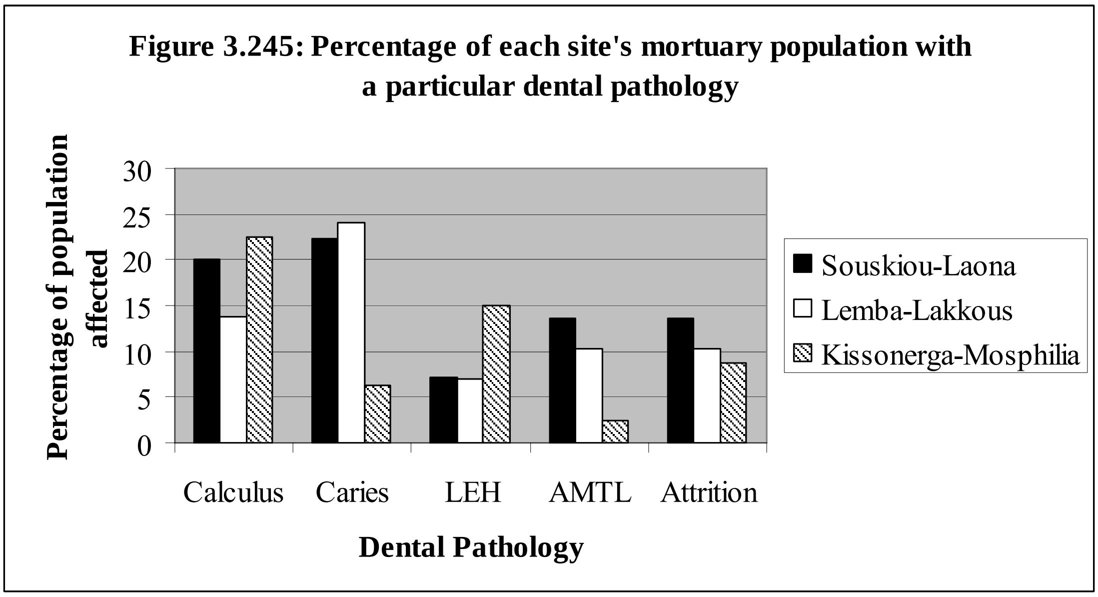
Pathology	**Souskiou-*Laona***	**Lemba-*Lakkous***	**Kissonerga-*Mosphilia***
Dental Disease	74.1	31.9	29.0
Caries	74.1	29.8	6.5
Calculus	55.6	17.0	22.6
LEH	25.9	8.5	17.7
AMTL	44.4	12.8	3.2
Attrition	48.1	12.8	11.3
Trauma	44.4	4.3	1.6
Osteoarthritis	66.7	21.3	14.5
Disease/Disorders	11.1	12.8	9.7
Other Pathologies	22.2	6.4	11.3

3.3.4.1 Dental Disease

Table 3.336 (and Figure 3.245) presents the percentage of individuals, based on the total minimum number of individuals from each site, with a particular dental pathology to allow for comparison of pathological expression amongst the sites. The individuals at Souskiou-*Laona* and Kissonerga-*Mosphilia* display more calculus than those from Lemba-*Lakkous*. The individuals at Souskiou-*Laona* and Lemba-*Lakkous* display more carious lesions than those at Kissonerga-*Mosphilia*, with a more similar average of expression of the lesion. While there is no significant difference in expression of LEH, Kissonerga-*Mosphilia* displays twice the percentage of individuals with the defect than Souskiou-*Laona*. Souskiou-*Laona* displays significantly more ante-mortem tooth loss than the two settlement sites and while Souskiou-*Laona* displays significantly more attrition than Kissonerga-*Mosphilia*, expression between Souskiou-*Laona* and Lemba-*Lakkous* and Lemba-*Lakkous* and Kissonerga-*Mosphilia* is more closely correlated.

Table 3.336: Percentage of individuals at each site affected by a particular dental pathology, based on the MNI from each site

Site	Calculus	Caries	LEH	AMTL	Attrition
Souskiou-*Laona*	20.0	22.4	7.2	13.6	13.6
Lemba-*Lakkous*	13.8	24.1	6.9	10.3	10.3
Kissonerga-*Mosphilia*	22.5	6.3	15.0	2.5	8.8
Statistically significant difference?	Yes - SL and LL No – KM and SL or LL[82]	Yes – SL and KM and LL and KM No – SL and LL[83]	No – all sites[84]	Yes – SL and LL and SL and KM No – LL and KM[85]	Yes – SL and KM No – SL and LL or LL and KM[86]



In general, the teeth from Souskiou-*Laona* tend to present slightly higher percentages of pathology based on the minimum number of individuals. It must be remembered that these averages are based on the assumption that complete skeletons would have

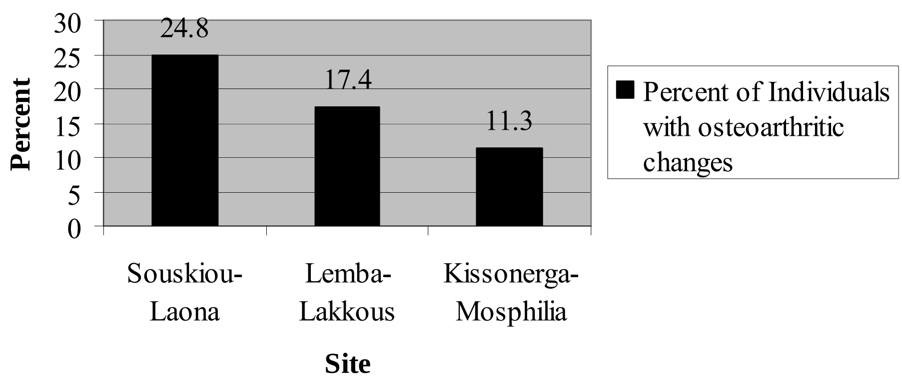
[82] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.032, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.065 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.874.
[83] Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.000, Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.002 and Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.083.
[84] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.613, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.977 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.619.
[85] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.040, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.000 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.129.
[86] Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.008; Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.064 and Kissonerga-*Mosphilia* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.711.

been examined. The above section, by bone element provides a more precise comparison based on specific recovery of each skeletal element and section.

3.3.4.2 Osteoarthritic Changes

Osteoarthritic changes to the articular surfaces represent the greatest percentage of postcranial pathologies at all three sites. Figure 3.246 presents the percentage of the overall mortuary population from each site which display osteoarthritic changes on at least one joint. The differences in general expression of osteoarthritic changes amongst the sites represents a statistically significant difference between Souskiou-*Laona* and the two settlement sites, however there is no significant difference between Lemba-*Lakkous* and Kissonerga-*Mosphilia*[87].

Figure 3.246: Percentage of the minimum number of individuals with osteoarthritic changes from all three sites



In regards to the differences amongst the sites based on the specific joint location, a higher percentage of all joints are affected at Souskiou-*Laona* than either of the two settlement sites. A more precise assessment of the MNI with osteoarthritic changes to a particular joint is provided based on the individual bones (above bone elements section) or based on individuals (above individuals section), as it examines the specific bone or joint. When osteoarthritic changes are examined in regards to each site based on the overall MNI a reflection of very general differences in expression is presented. Oneway ANOVA tests were run for the percentage of individuals with a particular joint affected by osteoarthritic changes at each site (Table 3.337). The results indicate that the vertebrae from Lemba-*Lakkous* display significantly higher

[87] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.002, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.000 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.302.

percentage of individuals with osteoarthritic changes than those from Kissonerga-*Mosphilia*. The rest of the bones/joints do not show a statistically significant difference in expression of osteoarthritic changes at the settlement sites. Souskiou-*Laona* on the other hand, shows statistically significant higher rates of osteoarthritic expression than both settlement sites on every joint with the exception of the ribs and the shoulders and there is no significant difference between Souskiou-*Laona* and Lemba-*Lakkous* in regards to the vertebrae and Souskiou-*Laona* and Kissonerga-*Mosphilia* in regards to the wrist. Therefore, osteoarthritic expression is quite similar at the two settlement sites, but significantly higher, for the most part, at the cemetery site.

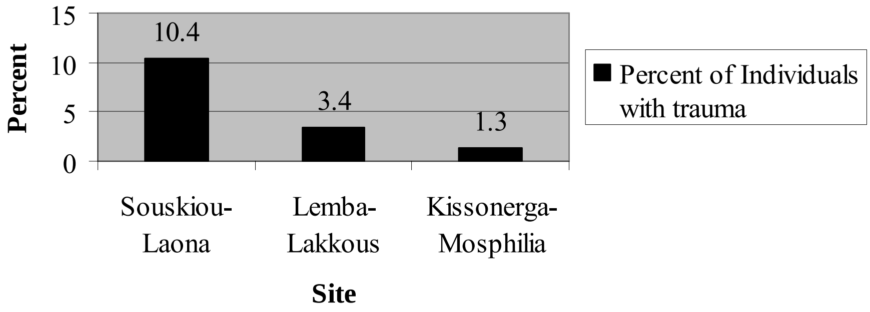
Table 3.337: Oneway ANOVA test results of percentages of the total individuals affected with osteoarthritic changes of each particular joint across the three sites

Sites analysed	ANOVA Results
Souskiou-*Laona* - Lemba-*Lakkous*	Vertebrae – p=0.071 Feet – p=0.000 Ankle – p=0.000 Hand – p=0.000 Elbow – p=0.007 Wrist – p=0.267 Shoulder – p=0.492 Ribs – p=0.359 Hips – p=0.001 Knee – p=0.001
Souskiou-*Laona* – Kissonerga-*Mosphilia*	Vertebrae – p=0.000 Feet – p=0.000 Ankle – p=0.000 Hand – p=0.000 Elbow – p=0.000 Wrist – p=0.039 Shoulder – p=0.106 Ribs – p=0.358 Hips – p=0.000 Knee – p=0.000
Lemba-*Lakkous* - Kissonerga-*Mosphilia*	Vertebrae – p=0.050 Feet – p=0.992 Ankle – p=0.952 Hand – p=0.947 Elbow – p=0.695 Wrist – p=0.538 Shoulder – p=0.571 Ribs – p=0.997 Hips – p=1.000 Knee – p=1.000

3.3.4.3 Trauma and Disease or Disorders

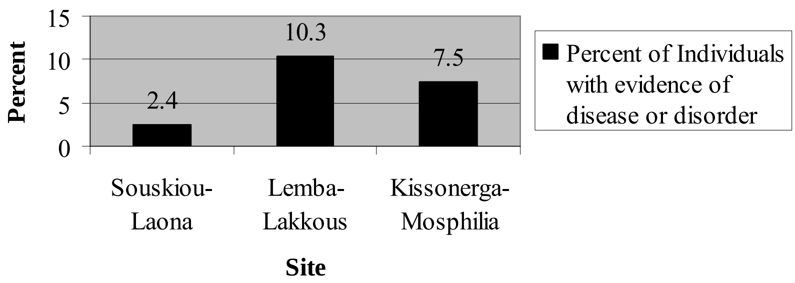
Souskiou-*Laona*, significantly, displays the highest percentage of individuals with evidence of trauma on at least one bone compared to the individuals at Lemba-*Lakkous* and Kissonerga-*Mosphilia*[88] (Figure 3.247).

Figure 3.247: Percentage of the minimum number of individuals with trauma from each site



Lemba-*Lakkous* displays the highest percentage of individuals with evidence of a disease or disorder of unknown aetiology (Figure 3.248). However, there is no statistically significant difference in the expression of possible evidence of disease across the three sites[89]. In regards to the number of individuals affected with a particular pathology in each burial complex, most often there was only one individual who displayed a particular pathology, even if there was more than one individual present within the burial complex.

Figure 3.248: Percentage of the minimum number of individuals with evidence of disease or disorder from each site



[88] Souskiou-*Laona* and Lemba-*Lakkous* – Oneway ANOVA Tukey HSD p=0.000, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.000 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.650.

[89] Souskiou-*Laona* and Lemba-*Lakkous* - Oneway ANOVA Tukey HSD p=0.435, Souskiou-*Laona* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.946 and Lemba-*Lakkous* and Kissonerga-*Mosphilia* - Oneway ANOVA Tukey HSD p=0.476.

3.4 Conclusions

Overall, the results presented in this chapter indicate that pathologies can be observed on the poorly preserved skeletal material from the Chalcolithic period. In general, there are very few pathological changes to the skeletal material from the three sites which is likely the product of a number of factors including: poor preservation, incomplete skeletons and/or actual low levels of prevalence of disease/trauma amongst the Chalcolithic populations. The skeletal series, while not directly indicative of the living population can provide an idea of some of the disease processes present during this period. The observations and calculations here are presented with the three different foci; by individual, skeletal element and mortuary feature, to provide the most comprehensive study possible of the palaeopathology of the skeletal material as a reflection of the mortuary populations. Interestingly, while the numbers themselves are different based on the particular focus of the analysis, the general conclusions tend to agree, whether analysed by individual, element or mortuary feature. The significant differences in pathological expression observed amongst the three sites can be used to indicate whether different burial location correlates to different pathological expression. Due to the commingled nature of most of the human bones, the analysis of the skeletal remains by skeletal element provides a more precise reflection of the occurrence of pathologies. The results of the palaeopathological analyses presented in this Chapter provide the basis for the discussion of the health status and disease processes in the Chalcolithic period. Within the discussion chapter, the results generated by the above analyses will be placed in the wider archaeological context in order to discuss possible interpretations for the causes of the lesions and to consider the patterns of pathological expression observed within the socio-cultural framework of the Chalcolithic period in Cyprus.

Chapter 4: Discussion

Chapter Three presented the results of the analysis of the pathologies observed, but what does this mean for the living individuals represented by these skeletons? In this chapter, the different pathologies observed at the three sites will be discussed by pathology type and the general severity of expression will be considered in regards to how the different pathologies recorded would have impacted on the lives of those affected. Tied into this discussion are concepts of pain and the effect of the pathology on the functioning of the affected body part. In conjunction with this will be a discussion of how the lifeways and environment of the Chalcolithic peoples could have caused or influenced the pathologies observed and furthermore will investigate whether the previous studies regarding the social relationships and structure can be understood through the pathological analysis. Understanding the severity of disease expression and its impact on the individual is complicated by the fact that, in order for the pathology to appear so extensively on the bone, the individual would have had to survive for a long period of time, which may reflect a less severe symptomology for the individual compared to those who experience a more acute version of the disease caused their death before the bones were affected. When considering pain, it is crucial to this discussion to acknowledge that not all osseous pathologies will cause pain to the individual. For example in many cases the mild osteoarthritic changes observed on the articular surfaces of the joints would have caused mild stiffness at the worst and no symptoms whatsoever in most cases. Thus, this chapter will discuss the observation of pathologies on a site-by-site basis with comparison amongst the three sites, drawing from the archaeological context to interpret aspects of the lifeways and social structure of the people living in the Chalcolithic period.

While all three skeletal samples are discrete and need to be considered in their own right, the lifeways and archaeological evidence of lifeways and social organization for this period are derived from the same sources. Our primary archaeological source for the cultural understanding of the Chalcolithic period is from the settlement sites, mainly Kissonerga-*Mosphilia*, as the most comprehensively published site. It must be assumed then, that until it is otherwise discovered, the individuals derived from all three contemporary sites experienced a similar lifestyle (barring differences in geography). The populations would have experienced a similar climate, lived in similarly constructed homes, had a similar subsistence economy and participated in similar subsistence activities and had relatively similar access to resources on the island[90]. Therefore, differences and similarities in pathological expression amongst the skeletal populations may reflect a disparity or similarity in subsistence economy or lifeways.

It is also important to consider that there is an inherent mortuary sample bias in any study of this nature, as discussed in Chapter Two, based on the fact that first of all, each skeletal collection represents those which were buried in a particular area and second of all were within the excavation area. As noted earlier, the individuals examined in this study are not the entire population from a given site, but a sample of the population from that site. It is not possible to determine if they represent a discrete group within the population as a whole, as that would require the rest of the population to place them within. Therefore, interpretations are based on the pathologies present within this sample of the population as representative of the population from the site and comparisons are made based on these interpretations, acknowledging that the comparisons being made between the sample from each site may not reflect a comparison between like groups within the general populations. The analysis of the pathologies observed are based on what is present, not what is absent, and are intended to reflect the experiences of the particular mortuary population sample which was examined and may not be necessarily be appropriate for the missing or 'unobserved' portion of the population.

Comparisons of the results of the pathological prevalence between the Chalcolithic Cypriot skeletal populations and other archaeological populations are made within this chapter. As discussed by Ortner and Aufderheide, it is often difficult to compare results from different studies as there is often little to no uniformity in the presentation of the results (i.e. results based on the prevalence amongst individuals or based on a prevalence amongst a particular skeletal element) (1991: 1). The Chalcolithic period in Cyprus roughly corresponds to the Early Bronze Age on the mainland Eastern Mediterranean and it was difficult to locate comprehensive palaeopathological studies

[90] The site publications of Lemba-*Lakkous* and Kissonerga-*Mosphilia* confirm these two sites share many similar patterns in activity in regards to subsistence and lifeways. There is only a preliminary publication for the Souskiou-*Laona* settlement site at this point and the discussion of the pathologies observed must therefore draw from parallels with the settlement sites.

from either the Chalcolithic or Early Bronze Age periods from the Near East for this study. Problem-oriented or site-specific studies for the Eastern Mediterranean and Near East are becoming more frequent in the literature, though there is still a heavy focus on the Neolithic or earlier periods (i.e. Angel 1980; Bocquetin and Bar-Yosef 2004; Hershkovitz *et al.* 1991; Molleson 2006, 2007a, b, c; Molleson *et al.* 2004, 2005; Nadel and Hershkovitz 1991; Ortner and Frolich 2007). Comparisons within the discussion below, for the Chalcolithic Cypriot populations, often involve the Natufian and Neolithic populations from the Levant (Eshed *et al.* 2004a, b, 2006, 2010) for several reasons despite the lack of chronological synchronicity. Firstly, the Natufian to Neolithic transition is one of the best documented periods for this part of the world particularly regarding health and disease of prehistoric populations at times of transition. Secondly, the geographic proximity of the Levant to Cyprus reflects possible similarities in climate (bearing in mind that Cyprus as an island will have slightly different flora and fauna based on the differences in the island environment). Thirdly, recent research seems to demonstrate that there is a possible ancestral link between Cyprus and the mainland Levantine corridor (Parras 2004, 2006; Peltenburg and Wasse 2004). Therefore, the comparisons of prevalence of pathology provided are aimed at placing the Chalcolithic populations within the general context of the Eastern Mediterranean and/or within the perspective of prehistoric populations in general.

Pain is a difficult topic to discuss particularly within archaeological samples, but also in modern populations. Pain, as such, does not have its own vocabulary. It is reliant on other descriptors and is a highly personal experience, situated within the cultural context of the individual (Melzack and Wall 1996: 36-37). Every individual experiences pain or discomfort differently and as such it can be difficult to quantify it. This is also coupled with social constructions and religious beliefs which can temper one's reaction to pain. For archaeological skeletal samples, it is perhaps not possible to discuss pain as it is impossible to know how one would have experienced the disease or trauma they suffered. In these cases it is perhaps more useful to discuss issues with use or the loss of use of a particular body part due to disease or trauma. For example, where a carious lesion has exposed the pulp cavity and possibly the tooth root while the person was alive it is not possible to know how that person would have felt that pain or indeed if they would have found it painful at all. However, if the carious lesion is severe enough to have destroyed a portion of the occlusal surface, it would have affected the ability of the individual to chew their food and the infection could be spread throughout the body through the circulatory system. Therefore, when a bone or tooth displays a pathological lesion the severity must be considered to possibly indicate whether functional impairment would have resulted, either of the element itself or whether it could have led to further complications.

The results from Chapter Three indicate that, despite the poor preservation and commingling of the human remains, palaeopathological analyses can be conducted and patterns of prevalence are present and will be interpreted. However, adjustments to palaeopathological analyses are required to deal with the differences in burial context in regards to commingled and articulated human remains and the poor preservation of the skeletal material. These changes in method are discussed in the section below. In the following sections, each of the different pathology types will be discussed in regards to the three different sites and differences between the sexes and interpretations in regards to the archaeological context.

4.1 Discussion of Changes to Method and Preservation Issues

One of the aims of this research conducted on the skeletal remains from the Chalcolithic period is to present and discuss some of the methodological changes required to deal with commingled and poorly preserved human remains. There are two main reasons that a bone or tooth could not be assessed for pathologies: (1) the element is too highly fragmented to permit assessment of the morphology or surface condition and (2) the surface preservation of the skeletal element is too highly eroded or obscured by taphonomic damage to ascertain if pathologies are present. 'It is important to realise that no single factor determines bone preservation alone' (Henderson 1987: 43). There are intrinsic and extrinsic factors which will impact the preservation of a bone element (Henderson 1987: 44-53). The taphonomic factors at work at all three Chalcolithic sites studied here need to be examined in further detail to understand what is actually occurring to affect the preservation of the skeletal tissue. When the skeletal tissue is poorly preserved the ability to observe pathological lesions on the surface of the bone and changes to bone morphology are more difficult, if not impossible to assess. Skeletal elements which are incomplete limit the observations possible for different lesions and when the skeleton is incomplete, diagnosis of disease becomes difficult or impossible as missing elements may be crucial to the interpretation.

Waldron produced a preliminary study on the relative survival of the human skeleton in the archaeological record and the implications of poor bone survival to the palaeopathologist (1987). In this study he created a scale of codes to deal with completeness of the bones of the human skeleton (Waldron 1987: 58). He determined a relative consistent relationship between size and survival, but also acknowledges that anatomic position may affect survival (Waldron 1987: 61). In this study Waldron notes that: 'Where survival is poor, there will be a tendency to underestimate the frequency of disease within a population…' (1987: 63). While Waldron accounts for levels of completeness of the bones, he does not appear to include scales for surface condition or levels of fragmentation. In order to deal with the poor surface condition and high levels of fragmentation of the Chalcolithic Cypriot skeletal material, a scale of descriptive categories were created specifically for these skeletal collections. Incorporating the descriptive categories allowed the observer to deal with the variations in preservation and gain an idea of why the results may appear as they do. Coding these scales of preservation creates numerical categories which allow for quantifiable results regarding the state of preservation of the skeletal elements.

To deal with issues resulting from the relative survival of the different skeletal elements, particularly in regards to the commingled skeletal material, each skeletal element was compared to like skeletal elements in the palaeopathological analysis. Furthermore, each part of a skeletal element affected by pathology was analysed with other like parts of the same skeletal element. For example, if pathology was observed on the proximal epiphysis of a humerus, the prevalence of pathology was calculated using only the proximal epiphyses of the humeri within the skeletal collection. This process was deemed most appropriate for these skeletal collections due to the general incompleteness of the skeletal elements and produces a more precise prevalence of a particular pathology on a particular part of a bone element.

As noted in Chapter Two, the general lack of complete skeletons from all three sites will have a negative impact on the ability to diagnose disease and interpret a number of pathologies on a single individual. In order to deal with the incomplete skeletons in the palaeopathological analyses in this study, the general completeness of the discrete skeletons was recorded, the joints were assessed as present or absent based on the presence of an articular surface and parts of the skeleton were only analysed with like parts. In general, diagnoses were limited and instead, pathological lesions were described and placed within a general 'type of pathology' category. For example, osteoarthritis was not diagnosed, rather the term 'osteoarthritic changes' was used to denote that lesions were observed that are typically associated with degenerative joint disease. In keeping to descriptive general categories, it is hoped that over-estimation of a particular pathology was avoided within this study.

The burial programmes and excavation methodologies at the three different sites seem to have an impact on the patterns of the results. There seems to be quite a bit of movement of skeletal elements around the settlement site burials. This, coupled with excavation, has resulted in the limited recovery of most of the small bones from the settlement sites. Waldron also observed that the phalanges and carpals tend to have very poor survival rates in the Romano-British population he examined and attributed this to the small size of the bones affecting taphonomic survival and excavation recovery (1987: 61). The epiphyses of the lower limb long bones seem to have the worst survival rate across all three sites, with those from Souskiou-*Laona* displaying the lowest survival rate of all three sites regarding the articulated discrete skeletons. The burial position of the articulated skeletons within the tombs at Souskiou-*Laona* seems to have affected the survival rate of the lower limb bones. The long bones of the leg of the articulated skeletons are often highly fragmented and there is very poor preservation of the epiphyses (hence the relatively low number of knee and hip joints which have survived). Part of the reason why the lower limb bones of the articulated skeletons from Souskiou-*Laona* are so poorly preserved and thus often unable to be assessed for abnormalities, may have to do with burial practice. The practice of resting the lower limbs of the articulated skeleton on the bonestacks of the tomb's predecessors seems to have a detrimental effect on fragmentation and preservation. It also contributes to the inability to associate the small bones of the feet with a particular articulated individual. This will of course make it limit the observation of pathologies to the feet of articulated discrete individuals.

Several suggestions for palaeopathological studies dealing with poorly preserved or commingled bone can be made based on the methods used for this study. (1) Incorporate qualitative standardized scales of assessment for surface condition, completeness and fragmentation levels of the skeletal material for a greater understanding of the limitations to the analysis. (2) Log each bone element as an independent data record to allow for comparison amongst like skeletal elements, regardless of burial context. (3) Record the parts of a skeletal element present, and analyse the observed pathologies based on the part of the skeletal element for a more precise prevalence. (4) Determine the presence or absence of a particular part of a skeleton and analyse the prevalence of pathology based on the parts, rather than the whole for a more detailed prevalence of pathology amongst the individuals. (5) When presenting the pathological lesions observed, describe the lesions and use a differential diagnosis approach to allow for greater scope in interpretation and to limit over-estimation of a disease. Therefore, incorporating commingled skeletal material into a palaeopathological analysis has its restrictions as interpretations based on age and sex are somewhat limited due to the inability to associate bones with a particular individual. Similarly, poor preservation restricts the type of pathologies which can be assessed and necessitates a more generalised approach to diagnosis. However, when dealt with appropriately, as listed above, commingled and poorly preserved remains can provide palaeopathological information and contribute to understanding the archaeological record. In the following sections each pathology type observed will be discussed based on the results from the analyses in Chapter Three.

4.2 Dental Pathology

Dental pathology is a good indicator of diet, oral health and general health of the population (i.e. Eshed *et al.* 2006; Goodman and Armelagos 1985; Hillson 1996; Larsen *et al.* 1991; Larsen 2002; Turner 1979). This section will discuss the main pathologies observed for the dentition of the Chalcolithic populations examined. While attrition is not pathological, it can be used to indicate tooth wear and diet both of which relate to the overall health of the individual (i.e. Armelagos and Rose 1972; Kennedy 1984; Powell 1985). In general, there were low levels of dental pathology observed across all three sites, with some inter-site variations.

4.2.1 Caries

Caries are the most common dental pathology observed amongst the individuals at Souskiou-*Laona* and Lemba-*Lakkous* with 29.8% and 28.6% respectively of the discrete skeletons displaying one or more carious lesion. This result is fairly consistent with some other prehistoric, agriculture-based populations around the world, when compared based on individuals with one or more caries (i.e. Buzon and Bombak 2010: 380 – 19.0-42.0%; Papathanasiou *et al.* 2000: 219 – 20.0%; Pechenkina *et al.* 2002: 31 – 27.8-29.3%), but it is lower than others (Delgado-Darias *et al.* 2005: 564-565 - 65.2% and references within; Watson 2008: 206 – 61.9% and for critique on site comparison see Wesolowski 2006). Different diets and susceptibility will affect the prevalence of caries in the different populations, making the comparison to other populations difficult. The discrete skeletons from Kissonerga-*Mosphilia* display significantly less caries (7.7%).

The percentage of the total number of teeth observed with a caries reflects a prevalence range of 0.4-5.5% of teeth across all three sites, with the teeth from Kissonerga-*Mosphilia* displaying significantly fewer carious lesions. There are a number of factors that can affect the prevalence of caries, including: diet, whether higher in cariostatic marine-based foods or cariogenic carbohydrates and sugars (Eshed *et al.* 2006: 149, Turner 1979); preparation of the food such as the practice of boiling agricultural foods into a soft sticky gruel (Larsen 1995) or stone-grinding grains; enamel composition, which is affected by the chemical and minerals within the soil and water (Scheneider 1986); and tooth wear, which can either lower the prevalence by wearing down the fissures on the crown (Chazel *et al*. 2005) or raise the prevalence due to dental pulp exposure (Hillson 2001). Turner (1979) created a generalised standard of worldwide percentages relating caries prevalence to different subsistence economies practiced. Accordingly, a higher prevalence of caries is associated with a higher consumption of agricultural products such as grains, while mid-range prevalence can be associated with a mixed foraging-farming lifestyle and low prevalence is possibly associated with a forager or fisher subsistence (Turner 1979). Given that the archaeological evidence from Kissonerga-*Mosphilia* indicates a highly agricultural population with increasingly less reliance on hunting, there is no evidence that the population at Kissonerga-*Mosphilia* had any greater reliance on marine products than those from Souskiou-*Laona* or Lemba-*Lakkous*, despite the lower prevalence of caries (Croft 1991, 1998; Elliot-Xenophontos 1998; Peltenburg 1998: 254). As discussed above, it is possible that the selection of the Kissonerga-*Mosphilia* population which is included in this study (i.e. those which were buried within the settlement and have been excavated) represent a group within the general population (for which we do not have any remains) which did not have access to or did not choose to consume more cariogenic foods. This would create an inherent bias in the interpretation due to a limited mortuary population. This bias cannot be ignored but as the assessment must be based on what is present, and it is not possible to presume what may have occurred in the missing groups, interpretation will have to be based on the observations of this selection of the population as representative of the whole. Therefore, population susceptibility based on enamel composition, dietary preference or availability of foodstuffs for any reason, tooth wear from mastication or non-masticatory uses of the teeth or oral hygiene practices may contribute to the general low prevalence of dental caries at Kissonerga-*Mosphilia*.

As the floral and faunal studies from this period reflect, those living in the Chalcolithic period consumed a varied diet including grains, meats, molluscs, fish, fruits and nuts (College 1985; Croft 1985; 1991; 1998; Irving 1998; Murray 1998; Ridout Sharpe 1985; 1998). The role of sweet fruits, such as grape, fig, hackberry, juniper, caper, olive and pistachio within the diet may play a role in caries prevalence for these populations (Murray 1998: 217). The nature of the botanical material, its manner of consumption and use will affect the rate of survival of the plant remains and make it impossible to determine the relative importance of a particular plant within the diet of the populations (Murray 1998: 216). There are no botanical studies from Souskiou-*Laona* as of yet. It is possible that the diets of the individuals from Souskiou-*Laona* and Lemba-*Lakkous* were closer in content, preparation or quantity than the diet consumed by those examined from Kissonerga-*Mosphilia*. Perhaps there was either a greater emphasis on fruits or carbohydrates within the diet or a different method of consumption or a general overall higher susceptibility to caries at Souskiou-*Laona* and Lemba-*Lakkous* than at Kissonerga-*Mosphilia*.

The posterior teeth from all three sites display a higher prevalence of carious lesions than the anterior teeth. This corresponds to previous studies which report that there is a higher prevalence of caries in the molars (i.e. Eshed *et al.* 2006; Hillson 2001; Luan *et al.* 1989). In regards to tooth position, the significant differences in expression amongst the three sites for the first molars, mandibular second molars and deciduous maxillary molars is possibly a reflection of the earlier eruption times and the longer exposure to cariogenic sources (Hillson 2001). The only deciduous teeth to display any caries are the first and second molars which again is likely due to their earlier eruption time and nature of the molar crown surface (Hillson 2001). There is no significant difference in the expression of dental caries based on side. There is a higher prevalence of caries observed on the maxillary teeth in comparison to the mandibular, which does not accord with Hillson's findings (2001). However, this did not prove to be statistically significant. The aetiology of dental caries is non-discriminative and due to the build-up of bacteria which can occur on any tooth regardless of side or jaw, therefore making it unsurprising that side does not play a role.

Those aged between 21-35 years at death display the highest prevalence of caries at Souskiou-*Laona* and Lemba-*Lakkous*, with the older adults displaying slightly lower prevalence. This corresponds more closely with results by Hillson of a multi-period study from Ancient Egypt and Nubia, where the younger adults generally display higher frequencies of caries (Hillson 1979: 157). It would be expected, based on the fact that the permanent teeth have a longer period of use, that the older individuals would display higher rates of carious lesions (Hillson 2001: 253). However, there are very few older individuals present at any of the sites and the effects of *in vivo* tooth loss will possibly affect this number (Lukacs 1996). Adults within both the young adult age range and adult age range display equivalent occurrences of carious lesions at Kissonerga-*Mosphilia*, most likely due to the overall low prevalence at that site and the low number of adult individuals present.

Despite females generally displaying a slightly higher prevalence of dental caries, there is no significant difference between males and females across the three sites. The higher prevalence of caries in females is a common phenomenon across various time periods and locations (Hillson 2001: 253; Lukacs and Largaespada 2006: 541). The causes for a higher female prevalence is attributed to three factors in agricultural populations: (1) earlier tooth eruption times in females, exposing the teeth to a cariogenic environment for a longer period of time; (2) the proximity of females to food during preparation resulting in snacking; and (3) pregnancy and hormonal influences (Lukacs and Largaespada 2006: 541). Therefore, while confirming that the higher prevalence of carious lesions observed amongst females at all three Chalcolithic sites is consistent with observations worldwide, these studies indicate there are several possible reasons for this occurrence. Given that Peltenburg has associated females with the domestic space and food preparation in the Middle Chalcolithic, it is possible that females were consuming a slightly different diet than males, who have been associated with hunting and herding (Peltenburg 2002: 59-60). This does not mean that the females from each site were consuming the same diet, but rather the cultural conventions within each population possibly permitted females a diet with access to more cariogenic foods than males. It is important to select comparison cultures which may have a diet more in line with one from the eastern Mediterranean when comparing pathological prevalence. For example, the maize heavy diet of prehistoric peoples in the Americas is very different from the more cereal based diet in the Near East and thus studies of the diet of populations from the Americas are less suitable for comparison with the Mediterranean populations (i.e. College 1985, 2003; Eshed *et al.* 2006; Lubell *et al.* 1994; Murray 1998). Therefore, the general observation that females display a higher prevalence of caries than males has several causative factors, including dental development, diet and hormones across all three Chalcolithic sites.

Pain associated with dental caries would have varied depending on the severity of the lesion. In many cases within all three samples the lesions were relatively minor and the pulp cavity was not affected. In cases where the pulp cavity and tooth root were affected, the root nerve would have likely receded and the tooth would have died, eliminating or at least limiting the amount of pain felt. Interestingly, the worse case of dental pathology (with ante-mortem tooth loss, LEH, calculus, dental cavities resulting in osteomyelitis and heavy attrition) observed, Grave 571 from Kissonerga-*Mosphilia*, does not display any dental caries on the remaining teeth. Again it must be noted here that, as caries can result in tooth loss during life, the number of teeth which would have been affected by caries is likely higher overall. The worst case of dental caries was observed in the female adult from Grave 22 from Lemba-*Lakkous.* This individual displayed four teeth with caries and a possible apical abscess due to infection from the exposed pulp cavity.

4.2.2 Calculus

Calculus accumulation is often used to discuss elements of diet and oral health within archaeological skeletal populations (Lieverse 1999: 219) and seems to be present in all periods of human existence (Roberts and Manchester 2005: 72). Supragingival calculus is the most common dental pathology observed amongst the individuals at Kissonerga-*Mosphilia* with 29.2% of the discrete individuals displaying one or more teeth with calculus, followed closely by 23.8% of individuals from Souskiou-*Laona*. This is in significantly more than the discrete individuals derived from Lemba-*Lakkous*, where 16.3% display one or more tooth with calculus. As Roberts and Manchester (2005: 72) observe, comparisons amongst sites is difficult due to the differences in recording in the different pathological reports, whether based on individual prevalence or tooth prevalence. It was decided to compare calculus accumulation based on the number of affected teeth rather than individuals, as a suitable comparable study for individuals could not be located at this point.

In regards to the severity of calculus accumulation, all three sites display rather mild accumulation (Chapter 2, Figure 2.10). This is most often observed as a mild ridge or flecks of calculus on the buccal/labial or lingual side of the crown. The calculus most often observed on the teeth from the Chalcolithic period is mild to moderate supragingival ridges while there is almost no subgingival calculus observed. It is possible that the absence of subgingival calculus is due in part to poor preservation of the tooth root. The nature of subgingival calculus deposition may also prevent observation as it is so dense and firmly attached that it can be mistaken for osteocementum, particularly where surface preservation is poor (Aufderheide and Rodriguez-Martin 1998: 402).

When examined by tooth, the percentages of teeth displaying calculus are consistent between Souskiou-*Laona* (10.7-12.6%) and Kissonerga-*Mosphilia* (11.1-15.2%) with the Natufian populations in the Levant (14.3%) (Eshed *et al.* 2006: 150). While the Natufian population is an earlier hunter-gatherer society, they possibly consumed similar foodstuffs (i.e. deer/gazelle and grains) to the Chalcolithic Cypriot populations as Eshed *et al.* believe that the types of foods consumed did not change when farming was adopted in this region, rather their management of their ecosystem changed (2006: 145). The percentage of teeth displaying calculus is significantly lower at

Lemba-*Lakkous* (5.4-7.3%). High levels of calculus are correlated with a dependence on agricultural products and increased consumption of animal products (Brothwell 1981; Eshed *et al.* 2006: 155; Lieverse 1999; Lukacs 1989). It accumulates on teeth faster when there is a high protein and/or carbohydrate diet as calculus favours an alkaline oral environment (Roberts and Manchester 2005: 71). However, calculus is also caused by poor oral hygiene and non-masticatory uses of the teeth indicating that diet is not always the sole cause. Therefore, there are a number of reasons which could contribute to the lower prevalence of calculus at Lemba-*Lakkous* compared to the other two sites. Another factor which may have an impact on the results is the excavation and curation of the dentition. If during cleaning, the calculus was not recognized it is possible that it was considered concreted soil, not an unlikely prospect given the preservation of the skeletal material, and was 'cleaned' off (Lieverse 1999).

There are some differences in the expression of calculus according to tooth position across the three sites. In general, the mandibular teeth display higher prevalence of calculus than the maxillary teeth at all three sites, most likely to the higher frequency of observation on the mandibular incisors. Calculus most commonly develops on the lingual side of the mandibular incisors and buccal side of the maxillary molars, due to their proximity to the salivary glands and the role saliva plays in calculus accumulation (Roberts and Manchester 2005: 72). The anterior teeth display higher frequencies of calculus at both Souskiou-*Laona* and Kissonerga-*Mosphilia.* However, the third molars at Lemba-*Lakkous* display the highest prevalence which is most likely due to sampling bias as few third molars are present. The higher prevalence on the anterior teeth at the other two sites may be due to the different uses of the teeth, where the masticatory use of the molars will remove most of the plaque build-up. In general, the severity of expression of the calculus is greater at the settlement sites, particularly Kissonerga-*Mosphilia* where a number of anterior teeth display planks of calculus on their surfaces. There is no significant difference in calculus expression based on side, likely due to the aetiology of the pathology which affects all teeth with plaque build-up.

Calculus was only observed on deciduous dentition from Kissonerga-*Mosphilia* and not at the other two sites. There is an increase in the occurrence of calculus accumulation on the dentitions of older adult individuals at Souskiou-*Laona* and

Lemba-*Lakkous*. However a greater percentage of young adults at Kissonerga-*Mosphilia* display calculus. This discrepancy cannot be explained as it would seem more likely that the longer the period of exposure to the micro-organisms which attach themselves to the tooth as plaque, the higher the prevalence of calculus. However, in general, calculus is not necessarily an age-related pathology as its aetiology is more closely linked to the microbial state of the mouth (Lieverse 1999).

Males across all three sites display a higher prevalence of calculus than the females, particularly at Kissonerga-*Mosphilia* where 80% of the males display at least one tooth with calculus. This result is in agreement with previous studies which indicate that males tend to have a greater prevalence of calculus accumulation (Hillson 1996: 259 – and accords with modern studies (Beiswanger *et al.* 1989)). This could again reflect a differential access to particular elements within the diet based on sex, as is possibly suggested by the expression of dental caries. For example, previous studies indicate that higher consumption of animal products will result in a higher prevalence of calculus amongst individuals based on the alkalinity of the saliva and mouth (Pechenkina *et al.* 2002: 32). While the males and females at all three sites may not be consuming the same diet, there is a difference at all three sites between the sexes. Calculus can also be associated with variable levels of oral hygiene and non-alimentary uses of the teeth that may mechanically remove calculus such as chewing abrasive materials. Or on the other hand, using the teeth as a third hand for activities such as basket or cord making or dealing with textiles can cause a build up of saliva in the mouth thus promoting calculus build-up (Lieverse 1999:229-230; Molleson 2006, 2007a: 9). It is possible that one of these behavioural factors have influenced the pattern of calculus expression, for better or worse, at all three sites (Molleson 2006, 2007a).

Calculus can lead to an inflammation of the soft tissue (gums) which may cause some discomfort. Furthermore, calculus can lead to periodontal disease which will impact the health status of the individual and can be the cause of *in vivo* tooth loss and other oral health problems. So while periodontal disease was not assessed within this study due to poor preservation levels of the alveoli, the accumulation of plaque can indicate oral disease. In general however, the accumulation of plaque itself will not have a great effect on the individual in regards to the use of the dentition. Therefore, while in severe cases, such as at the individual from Grave 571 at Kissonerga-*Mosphilia*, calculus would have been a part of a host of dental pathologies affecting the individual, the plaque itself would not have caused pain for the individual. In this case, the resulting inflammation would have been one symptom of many where ante-mortem tooth loss and apical abscesses were present to a greater extent.

4.2.3 Linear Enamel Hypoplasias (LEH)[91]

The prevalence of LEH was in general quite low across all three sites. Overall, only 9.5% of the discrete individual skeletons at Souskiou-*Laona* display the defect, all of which are between the ages of 12-35 years at death. This compares to the 8.2% of the individuals at Lemba-*Lakkous* and 18.5% of individuals at Kissonerga-*Mosphilia.* In the current study, Kissonerga-*Mosphilia* displays a significantly higher prevalence of LEH. None of the deciduous teeth examined display the defect. As LEH is a marker

[91] As noted in Chapter 3, the results from the current analysis of the prevalence of LEH supercede those from the earlier preliminary work of the author's Master's thesis. The results of the earlier study are based solely on the canine teeth. When the results from the canine teeth from the previous study are compared to the results of the canine teeth from the current study, there are some discrepancies in regards to the prevalence of LEH by number, however the overall observations are still relevant as the relative differences in expression are still accurate, if not precise. The main difference in regards to relative differences in expression of LEH is between the sexes at the settlement sites. The prevalence of LEH on the canines from Souskiou-*Laona* present the greatest discrepancy in results. The sample size from Souskiou-*Laona* for the earlier research however was smaller than that of the current study. As well, there is a discrepancy in the percentage of males which display LEH at the combined settlement sites, which once again may be attributed to the sample size and general small size of the male population at the settlement sites. The minimum number of individuals examined from the combined settlement sites was 54 in the previous study and 114 for the current study. The table below presents the percentages of each canine tooth and each sex with LEH from the previous study and the current study.

Canine/Sex	**Souskiou-*Laona* Previous study**	**Souskiou-*Laona* Current study**	**Combined settlement sites Previous study (mainly LL with small KM sample)**	**Lemba-*Lakkous* Current Study**	**Kissonerga-*Mosphilia* Current study**
Max L	15.1	2.0	25.0	7.7	19.0
Max R	21.6	4.3	27.3	8.3	23.5
Man L	25.8	6.0	26.7	25.0	33.3
Man R	16.2	8.0	22.2	25.0	28.6
Male	12.5	6.7	0.0	25.0	40.0
Female	14.3	15.6	25.0	20.0	30.8

of general health status and particularly related to incidences of physiological stress in childhood as the tooth is forming, the higher prevalence of expression at Kissonerga-*Mosphilia* may reflect periods of systemic metabolic distress such as nutritional deficiency caused by a lack of foodstuffs either due to availability or a socio-cultural restriction or perhaps a childhood illness. Because there are many different aetiologies for a hypoplastic defect in the enamel it is not possible to hypothesise the specific causes of the overall higher prevalence at Kissonerga-*Mosphilia*. In general, causes of LEH can include: metabolic disturbances due to nutritional deficiency, disease, fever, trauma or cultural practices and activities which limit foodstuffs to a particular group within the population or perhaps intentionally or unintentionally provide a nutritional deficiency through ritual practice at a particular age. LEH have often been used to discuss weaning of infants or children, as the chronology of tooth development is fairly well known, and by examining the location of the LEH, the age of the individual at the time of the defect can be determined (Reid and Dean 2000; Roberts and Manchester 2005:76-77).

When the prevalence of LEH is examined by tooth, the prevalences are lower still (1.6-4.2% of the whole tooth sample) and are significantly lower than other studies of LEH which in some cases reflect a prevalence of LEH on more than 50% of the teeth observed (i.e. Cucina 2002; Cucina & Işcan 1997; Fischer & Norén 1989; Goodman *et al.* 1980; Wright 1997). There is no significant difference in the expression of LEH from all three sites based on whether the tooth is from the upper or lower jaw or right or left side of the mouth. Overall, the maxillary and mandibular canines display the highest prevalence of LEH of all the permanent teeth from all three sites (8.0-33.3%). This agrees with previous studies which have demonstrated that the incisors and canines tend to exhibit higher frequencies of LEH (Boldsen 2007; Goodman and Armelagos 1985; Lanphear 1990). The nature of the incisor root often causes these teeth to be lost post-mortem which can have an impact on the prevalence observed for this tooth (Goodman and Armelagos 1985; Hillson 1996: 21).

While not typically age-related, given that a hypoplastic line in the enamel indicates a period of physiological stress in childhood, studies indicate that there is a correlation between longevity and the occurrence of LEH (Boldsen 2007: 65; Goodman and Armelagos 1988: 942; Goodman 1991: 284). In some ways this is counter-intuitive given that the appearance of the defect clearly indicates that the individual survived the assault. Across all three sites the highest percentage of individuals with at least one tooth with a LEH are young adults, between the ages of 21-35 years at death. There are only a few adolescents and children who display LEH at Lemba-*Lakkous* and Kissonerga-*Mosphilia*. It would seem, therefore, that the stresses suffered in childhood which caused the enamel defect were not severe enough to cause premature death, as in general whether LEH was observed or not, the largest portion of adults from all three sites died within the younger age range. More detailed analysis using histological examination is required for teeth displaying the defect to ascertain if there is a specific time in tooth development during which the assault occurred.

While not statistically significant, females at Souskiou-*Laona* tend to display a higher prevalence of LEH, while males exhibit a higher prevalence at the settlement sites. Whether these differences reflect a physiological susceptibility or a cultural belief or practice which provides females with a buffer in childhood to limit the appearance of LEH at the settlements and males at the cemetery is unclear. If there were preferential treatment which buffered a particular group from metabolic disturbances or physiological stress during childhood within the populations, this could be reflected in the expression of LEH. However, the inability to determine the sex of subadult individuals and the complex relationship between biological and social status, limits any discussion of the differences in prevalence of LEH amongst adults in regards to causes of the defect based on sex. The only conclusive evidence from this study indicates that females from the Souskiou-*Laona* and males from the settlement sites skeletal series' experienced more physiological stress than the opposite sex from their particular burial location.

As none of the deciduous teeth examined across all three sites display LEH, this would seemingly indicate that pregnant women and infants in their first years of life while the deciduous teeth are forming, did not suffer from physiological stresses which could cause a defect in the enamel of the foetus/infant. A homogeneous response to physiological stress that does not affect the formation of enamel could also result in the lack of defects. Lunt indicates that infant mortality was quite high during this period, which would have placed greater importance on the fertility of the women and health of the children for the stability of the community (Bolger 2002: 81;

Lunt 1985: 246). So, given the awareness of the fragility of young life perhaps extra effort was given to ensuring that physiological stress to the young was avoided where possible. The archaeological evidence in regards to the possible social status of women and children is primarily derived from studies by Bolger (1992, 1994, 1996, 2002, 2003) and Peltenburg (1991, 2002) relating to aspects of social complexity and socio-political exchange. The ritual deposit from Kissonerga-*Mosphilia* is described within the context of a 'Cypriot ideology of birth' and taken to represent a focus on fertility and birth in the early Middle Chalcolithic population (Peltenburg 1991b: 98-100). The figurines and the picrolite pendants which are described by Peltenburg as '… integral to the formation and maintenance of the social customs involving birth…' are thus associated closely with the females and children respectively (Peltenburg 1991a:114). Peltenburg furthermore states that picrolite was a prestige item based on its inclusion in only a select number of graves (1991a: 114). Picrolite figurines and pendants have thus far primarily been associated with children's burials at the settlement sites (Bolger 2002: 72-74). The inclusion of 'prestige' items with children may reflect a particular reverence for children within the Middle Chalcolithic period, which may be tentatively supported by the limited expression of LEH in the permanent teeth across all three sites. However, this connection is speculative at best (further discussion regarding social status of different biological groups is below, in particular relating to picrolite). Thus the only conclusive statement regarding the health status of the populations examined here which can be made, is that all three skeletal samples experienced low frequency of physiological stress while the teeth were forming in childhood.

4.2.4 Ante-mortem tooth loss (AMTL)

Ante-mortem tooth loss was quite low across the three sites in general, particularly when discussed by individual. It is difficult to compare results of AMTL with other studies which produce their results based on the loss from a complete dentition with the maxilla and mandible still more or less intact (i.e. Buzon and Bombak 2010: 378 Eshed *et al.* 2006: 148; Lukacs 2007; Watson 2008: 207). The poor surface preservation and high fragmentation of the mandibles and maxillae makes it difficult to assess the percentage of teeth lost *in vivo* because often portions of the alveolar bone are missing or damaged. The discrete individuals from Lemba-*Lakkous* display the highest prevalence of AMTL as15.4% of discrete individuals with a maxilla or mandible from the site have lost at least one tooth *in vivo*. This result is followed by that from Souskiou-*Laona* with 10.6% of individuals with a maxilla and/or mandible exhibiting AMTL and significantly higher than the results from Kissonerga-*Mosphilia* where only 4.1% of the discrete individuals display the loss of at least one tooth *in vivo*. There are many reasons for tooth loss during life, including trauma, carious lesions, periodontal disease, apical cavities or abscesses and modification. In most cases, it is impossible to determine the cause of the tooth loss and resultant alveolar remodelling (unless an apical cavity is still evident).

The most common maxillary tooth lost during life at Souskiou-*Laona* is the left first molar. At Lemba-*Lakkous* and Kissonerga-*Mosphilia*, only one maxilla per site shows evidence of AMTL, therefore there is no way to assess the prevalence of loss for a particular tooth across the site. This will also affect the average tooth loss per maxilla[92]. At Souskiou-*Laona*, the average number of teeth lost per maxilla with AMTL is 2.1 teeth. Therefore, while bilateral tooth loss is not particularly common (two possible cases) it does occur and may reflect evidence of periodontal disease. The average number of teeth lost per maxilla is affected by particularly severe cases, such as the maxilla from within the bonestack in Tomb 200 where almost all the teeth from the right side are missing. The posterior maxillary teeth are more commonly lost *in vivo* than the anterior teeth which possibly indicates that carious lesions were more prevalent than the results indicate as the posterior teeth tend to be more commonly affected by caries, while periodontal disease more often leads to the loss of the anterior teeth (Backett and Lovell 1994; Clark and Hirsch 1991).

In general, there is a higher prevalence of mandibular teeth lost *in vivo* than maxillary teeth. The most common mandibular tooth lost during life at Souskiou-*Laona* is the left first molar, while at Lemba-*Lakkous* the left second molar is most commonly lost. At Kissonerga-*Mosphilia,* the third molars represent the most commonly lost tooth although it is also possible that these teeth are congenitally absent. Radiographs are required to confirm or disprove whether the teeth are missing for genetic reasons. There is one possible extreme case of bilateral absence (possibly congenital) of the molars from Lemba-*Lakkous* where all three molars from both sides are missing

[92] The maxilla from *Mosphilia* is from Grave 571 and the maxilla from Lemba is from grave 53.

(Grave 25). The average number of teeth lost per mandible with AMTL is 1.4 from Souskiou-*Laona*, 2.5 from Lemba-*Lakkous* and 2.7 from Kissonerga-*Mosphilia*. However the differences in prevalence is not statistically significant, nor are the slight differences in the average number of teeth lost. One individual at each settlement site has lost many teeth effectively skewing the number of teeth lost per individual at these sites. Once again the posterior mandibular teeth are more commonly lost than the anterior teeth *in vivo*, which may indicate that caries were more prevalent than the earlier results suggest.

The prevalence of AMTL increases in correlation with the age-at-death estimations at all three sites. This most likely reflects the causes of tooth loss as the older the individual is the more likely they are to have acquired dental caries, heavy attrition, periodontal disease or various other mechanical means of tooth loss due to their longer period of use. While AMTL can occur at any age, studies reflect the correlation between dental caries and periodontal disease with AMTL (Hillson 1996; Armelagos and Rose 1972; Backett and Lovell 1994; Lukacs 1992). Thus, the relatively low prevalence of AMTL implies a low occurrence of periodontal disease and reflects the low occurrence of dental caries.

There is a disparity in the expression of the prevalence of the AMTL based on sex. Significantly more discrete male skeletons from Lemba-*Lakkous* display AMTL than either Kissonerga-*Mosphilia* or Souskiou-*Laona*. At Souskiou-*Laona*, the prevalence of AMTL is quite similar between the sexes overall but significantly different when just the maxilla is considered, while at Kissonerga-*Mosphilia* the only two cases of AMTL both affect females. Because of the many different causes of AMTL it is difficult to assess what may be causing these differences in and amongst the three skeletal samples. The prevalence of AMTL per individual derived from Lemba-*Lakkous* and Souskiou-*Laona* are similar to other prehistoric populations, however the prevalence of those from Kissonerga-*Mosphilia* is quite a bit lower (i.e. Buzon and Bombak 2010: 378; Lukacs 2007: 160; Watson 2008: 207).While there are significant differences in AMTL between the male discrete skeletons, there is no significant difference when the total number of maxillae and mandibles are assessed. This includes jaws which could not be associated with a discrete individual and indicates that perhaps the prevalence of AMTL is not significantly different between the sexes.

The congenital absence of teeth has been touched upon briefly and will be mentioned in the section below.

4.2.5 Apical Abscesses

As noted above, apical abscesses can be the cause of tooth loss during life. None of the subadult maxillae from any of the sites display apical abscesses. However, 7.7% of the subadult mandibles from Souskiou-*Laona* and 4.2% of the subadult mandibles from Lemba-*Lakkous* display an apical abscess. There is one incidence of an apical cavity in an adult maxilla from Souskiou-*Laona* (1.1%). However, the majority of apical abscesses observed within adult maxillae and mandibles are from Kissonerga-*Mosphilia* with a prevalence of 10.0% and 10.5% respectively. Apical abscesses were only calculated based on individual and not by tooth to ensure a more precise reflection of the prevalence as the fragmentation of the maxillae and mandibles can result in difficulties in identifying the location of the abscess. Overall, the general prevalence of apical abscesses corroborates the generally low levels of AMTL in both the maxillae and mandibles. The expression of apical abscesses in the mandibles and maxillae at Kissonerga-*Mosphilia* is substantially lower than the individuals from the Nile Valley in the New Kingdom (41.0-62.0%) (Buzon and Bombak 2010: 379). This disparity between the Chalcolithic Cypriot and Egyptian populations in prevalence is likely due to differences in diet, food preparation and tooth wear, as the exposure of the pulp cavity will often lead to infection into the root apex (Buzon and Bombak 2010: 382). A more similar comparison group, based on geographical proximity, chronological synchronicity or diet could not be found to discuss the differences in apical abscesses based on individuals at this time.

Apical abscesses can be a result of an infection which had destroyed the alveolar bone at the apex of the tooth root or a dental cyst (Dias and Tayles 1997; Ortner 2003: 592). Abscesses which form are often due to carious lesions which penetrate the pulp cavity and an infection of the supporting tissues results (Ortner 2003: 592). The worst case of dental abscessing is from Kissonerga-*Mosphilia*, Grave 571 where the female individual displays a number of apical abscesses in both the maxillae and mandible, resulting in osteomyelitis of the mandible. This individual would most likely have had a number of pus-seeping wounds to the jaws. While the quality or quantity of pain this individual would have felt cannot be known, the loss of teeth and supporting tissues would have likely impacted the types of food she would have been able to consume and her ability to use her teeth and jaws. In general the low frequency of occurrence of apical abscesses do not allow for any correlation with diet or activity. The low rate of apical abscesses is consistent with the overall low prevalence of dental caries and AMTL across all three sites.

4.2.6 Attrition

The rate of dental attrition within a population has many different factors, for example the consistency and texture of food, manner of food preparation, cultural practices, force of occlusion, age, sex and/or the quality of the tooth (i.e. Hillson 1979; Molnar 1972; Ortner 2003: 604; Scott and Turner 1988; Walker *et al.* 1991). Therefore, it is difficult to make conclusive statements about the causes of the patterns of attrition within and amongst populations. A greater percentage of the discrete individuals from Souskiou-*Laona* (17.9%) display heavy attrition than from the two settlement sites (10.8% at Kissonerga-*Mosphilia* and 14.3% at Lemba-*Lakkous*). This is possibly a reflection of the fact that a greater percentage of the population at Souskiou-*Laona* are older adults, in comparison to the generally younger age at death of the skeletally mature individuals from the settlement sites. Environmental and food preparation factors such as the consumption of sand, dried fish and stone-ground grain have been found in previous studies to increase the levels of attrition (i.e. Jurmain 1990; Littleton and Frohlich 1993; Macchiarelli 1989; Powell 1985). While Kissonerga-*Mosphilia* and Lemba-*Lakkous* are much closer to the coast than Souskiou-*Laona*, fish does not seem to have played a significant role in their diet and stone-ground grain was a dietary staple at all three sites (Peltenburg *et al.* 1998). Therefore, given the possible similarities in food preparation and diet amongst all three sites, the higher rate of expression of at Souskiou-*Laona* most likely cannot be explained by diet.

When all the teeth from all three sites are examined, those from Souskiou-*Laona* (3.1-6.4%) and Lemba-*Lakkous* (5.1-6.2%) display significantly higher frequencies of attrition than those from Kissonerga-*Mosphilia* (2.4-2.9%). There is no difference in attrition levels between the maxillary and mandibular teeth at the settlement sites although significantly more maxillary teeth are heavily worn at Souskiou-*Laona*. This is atypical of previous studies dealing with attrition where typically the mandibular teeth display a higher prevalence of heavy attrition (Hillson 1996:237). There is no difference in expression regarding side, reflecting equal use of the teeth regardless of side. Interestingly, the tooth type with the highest prevalence of attrition is different from each site and not always a posterior tooth. At Souskiou-*Laona* the first molars display the highest percentage of teeth with attrition, while the second premolars display the highest at Lemba-*Lakkous* and the permanent canines display the highest prevalence at Kissonerga-*Mosphilia*. Whether this reflects differences in occlusion or different uses of the teeth cannot be determined given the state of preservation. As many of these teeth are loose and the occlusal plane cannot be established in most cases, it will not be possible to determine whether the opposing tooth played a role in the level of attrition observed.

Levels of attrition vary amongst populations. However, hunter-gatherers tend to show more rapid wear with heavy anterior tooth attrition when compared with agriculturalists (Hinton 1981, 1982 in Hillson 1996:237). Other factors both biological and cultural may affect the specific teeth involved with high levels of attrition (Hillson 1996: 242). When the percentage of teeth displaying heavy attrition based on tooth location from all three sites are compared to the results of attrition from the Natufian (6.6-6.7%) and Neolithic (6.1-6.3%) periods in the Levant, all three Chalcolithic sites display slightly lower prevalence of heavy attrition than the mainland earlier sites (Eshed *et al.* 2006: 148). Again, the Levant populations were selected for comparison with the Cypriot ones for their geographical proximity and similarity in food types available at both locations. On a tooth-by-tooth basis the incisors from the Levantine samples in particular show much higher prevalence of heavy wear compared to the relatively low levels of attrition at the Chalcolithic sites. This agrees with the earlier observation that agriculturalists will tend to wear their teeth to a lesser degree than hunter-gatherer populations.

The difference in the prevalence of attrition amongst the discrete skeletons from all three sites proves to be statistically significant only within the young adult age category, with those from Souskiou-*Laona* displaying the highest frequency. Attrition in general is an age-related change. Therefore, it is unsurprising that the prevalence of individuals with at least one heavily worn tooth increases in correlation with the age ranges. Only four deciduous teeth derived from Kissonerga-*Mosphilia* display heavy attrition, with no comparable teeth from Souskiou-*Laona* or Lemba-*Lakkous*. The one discrete individual, under the age of 12 years at death from Kissonerga-*Mosphilia* displays heavy attrition on several teeth which may reflect a retained set of molars. Attrition is inherently an age-related phenomenon and can therefore be used as an age estimation tool (i.e. Brothwell 1989; Miles 1963; Ubelaker 1985). However, it must be approached with some caution as there are many different causes of tooth wear which cannot always be accounted for within the archaeological samples. As Hillson reports, age estimation by tooth wear will vary across populations (1996: 239).

The occurrence of attrition between the sexes indicates that more females than males have at least one heavily worn tooth at Souskiou-*Laona* and Kissonerga-*Mosphilia,* while the opposite is true for Lemba-*Lakkous* (Hillson 1996: 237 presents differences in levels of attrition based on sex). The fact that none of the males at Kissonerga-*Mosphilia* display any teeth with heavy attrition is likely correlated to the younger age at death than the males from Lemba-*Lakkous* where attrition is rather severe and all the males are older adults. There is a statistically significant difference amongst the males from all three sites and a significant difference in attrition amongst the females from all three sites. However the percentage of females with at least one heavily worn tooth across all three sites is fairly similar and the level of severity amongst the female groups is similar (with one or two teeth affected). Overall then, the males and females from all three sites display varied levels of attrition. Higher rates of attrition are observed in hunter-gatherer populations, while agriculturalists rely less on seeds in their diet and thus require less strenuous mastication (i.e. Armelagos and Rose 1972; Kennedy 1984; Molnar 1971; Powell 1985). The general low levels of attrition at the Chalcolithic sites likely represents a more agriculturally based diet, and/or a more homogenous higher tooth quality to resist wear.

In regards to particularly severe cases of attrition, there are a number of cases across all three sites. At Souskiou-*Laona*, the expression of attrition is generally less severe and limited to only select teeth, with some exceptions (i.e. Skeleton G Tomb 207 where all mandibular molars recovered are heavily worn). At Lemba-*Lakkous,* while fewer individuals display heavy attrition, the cases tend to be more severe. For example, an adult female from Grave 22 displays heavily worn anterior teeth due to loss of molars, the individuals within Grave 26 exhibits unusual attrition and wear pattern due to dental disease and the individual within Grave 53 has general heavy wear on all remaining teeth. Skeleton C Grave 505 from Kissonerga-*Mosphilia* displays heavy wear on maxillary incisors, the adult from Grave 520 displays heavy attrition on most of the teeth and minimal on the rest and the female from Grave 571 where the loss of teeth and extensive dental disease have put the load of mastication on the anterior teeth. The observation of heavy attrition is in many cases connected to the loss of other teeth forcing the occlusal load onto fewer teeth. In most cases, the dentine has been exposed and there is evidence of secondary dentine. As many of these cases involve other aspects of dental pathology, the heavy and unusual attrition observed is in a way symptomatic of other pathologies or activities and reflect the changes in occlusion which would have occurred.

4.2.7 Periodontal Disease

Periodontal disease is often used to discuss oral health of a population as it reflects the accumulation of dental plaque causing inflammation of the soft tissue and resulting in the loss of alveolar bone (Hillson 2005: 304-305; Ortner 2003: 593). While alveolar recession is the most common way of diagnosing periodontal disease, other dental pathologies such as calculus accumulation and ante-mortem tooth loss can also be indications of the disease. It was difficult to assess for alveolar recession within these skeletal populations as the preservation of the alveoli was typically quite poor. Alveolar recession was observed in the maxillae and mandibles from only Souskiou-*Laona* and Kissonerga-*Mosphilia*. The maxilla displays a higher prevalence than the mandible, with four of the five cases observed occurring in the upper jaw. The maxillae from Kissonerga-*Mosphilia* are the most frequently affected with one adolescent and two adults (one male, one female) displaying evidence of alveolar recession. One adult mandible and one adult maxilla from Souskiou-*Laona* which display alveolar recession and none of the jaws from Lemba display any evidence of the pathology. Overall, the preservation of the alveoli at all of the sites is quite poor and while the rare cases of moderate to good preservation exist, any discussion of the observation of alveolar recession would not reflect an accurate prevalence of the pathology. Therefore, it is sufficient to say that there is evidence of periodontal disease in very limited numbers at Souskiou-*Laona* and Kissonerga-*Mosphilia*. Aspects of oral hygiene, diet and masticatory forces required for consumption or tool use can all play a role in the development of periodontal disease (Eshed *et al.* 2006: 155).

4.2.8 Conclusions on dental pathology

To summarize, the teeth from Souskiou-*Laona* displays the highest prevalence of dental caries and attrition, while the jaws from Lemba-*Lakkous* display the highest prevalence of AMTL and the teeth from Kissonerga-*Mosphilia* exhibit the highest levels of calculus, LEH and alveolar recession representing periodontal disease. Dental pathology can indicate possible patterns in diet, oral hygiene and general health status from non-specific indicators of physiological stress. Interestingly, there seems to be a male-female divide in regards to the types of pathologies expressed which is rather consistent across the three sites. In general, the males display higher levels of calculus, while females display higher prevalence of dental caries and AMTL. While the higher prevalence of caries amongst females compared to males is possibly connected to biological and hormonal factors, the higher prevalence of calculus possibly represents a difference in diet between males and females (but is also possibly biologically related as this trend is observed in modern populations). There is some disparity with the other pathologies, with the males from the settlement sites displaying higher prevalence of LEH than the females, while the opposite is true at Souskiou-*Laona*. However, there is no statistically significant difference in LEH between the sexes and the differences in expression cannot be attributed to any conclusive cause. Heavier attrition is observed more frequently on the teeth of the females at Souskiou-*Laona* and Kissonerga-*Mosphilia*, while males display a higher prevalence at Lemba-*Lakkous*. Again these differences are not statistically significant and cannot be associated with a particular cause. In general, the differences between the sexes indicates possible differences in diet, food preparation and/or susceptibility between the sexes in general and differences based on site.

The prevalence of carious lesions and AMTL of the posterior teeth of all the sites, may reflect a more sugary-carbohydrate laden diet than the current results seem to indicate, particularly amongst females. Calculus seems to occur with a higher prevalence in males possibly reflecting elements of a higher protein diet. However, it would seem that in general, while the occurrence of dental pathologies may be higher at Souskiou-*Laona*, the severity is greater at the settlement sites. Attrition in particular is more severe amongst the older adults at Lemba-*Lakkous* and Kissonerga-*Mosphilia*, which may be diet and/or age related. The overall low prevalence of LEH on the permanent teeth across all three sites could possibly reflect a cultural buffering which protected the majority of children from physiological stress or metabolic disturbances were not suffered by the populations or the Chalcolithic populations are not susceptible to LEH. While there are differences in dental disease expression across the three sites, particularly in regards to the male-female/protein-carbohydrate split, it would seem that all three sites display relatively low frequencies of dental pathology. The relatively varied diet which is indicated by the indirect sources of archaeobotanical studies, archaeozoology and material culture studies seem to reflect the variation in dental pathology which is expressed at the three sites. The overall prevalences of the various pathologies may be under-represented based on preservation issues with the dentition, such as surface condition and over-enthusiastic cleaning.

4.3 Osteoarthritic Changes

Osteoarthritic changes are examined within archaeological populations to discuss physical stress and activities undertaken by the population (i.e. Goodman *et al.* 1984; Hutchinson *et al.* 2007). The prevalence and severity of osteoarthritic changes is associated with activity and other localized cultural, behavioural and environmental factors (Larsen 2002: 134). Previous studies have indicated that an agriculturalist lifestyle is more physically demanding than the hunter-gatherer lifestyle in the Levant (Eshed et al 2004a, b; Molleson 1994). There is also evidence for a division of labour based on sex in the agricultural communities, with females gaining a more labour-intensive role in subsistence (Eshed *et al.* 2004 a, b; Larsen 1995). The individuals derived from Souskiou-*Laona* display the highest prevalence of osteoarthritic changes, with 58.1% of the skeletally mature individuals displaying at least one or more joint with osteoarthritic changes and the severity of the osteoarthritic changes is worst at Souskiou-*Laona* with more joints affected and typically a more extensive osteoarthritic change to the bone[93].

Jurmain notes that osteophytes, which were the most commonly observed degenerative change on the Chalcolithic Cypriot skeletal material, are more likely to be related to biological aging than mechanical stress which impacts the joint surface

[93] This is not a quantified statement, but one based on visual assessment and discussion of the osteoarthritic changes across the three sites. It does not hold true in all cases but does represent a generalized opinion on the pathologies observed on the bones.

(1991: 249). Weiss and Jurmain present the different and multifactorial aetiologies of osteoarthritis using clinical studies which indicate that it is an oversimplification of the pathology to directly correlate the observation of osteoarthritic changes with activities (2007). They also confirm the use of the analysis of osteoarthritic changes within a bioarchaeological framework in previous studies, particularly as a means of linking subsistence economy and prevalence and patterning of osteoarthritis (Weiss and Jurmain 2007: 438 and see also Larsen 1995; Cohen and Armelagos 1984 and Bridges 1992 for a critique).

The differences in the joints affected by osteoarthritic changes across all three sites potentially indicate that patterns of activity were sex based[94]. To summarise, females from all three sites display a higher prevalence of osteoarthritic changes to at least one bone in the foot and the wrist. The males from all three sites display the only osteoarthritic changes observed to the shoulder and generally a higher prevalence of degenerative changes to the ribs. Sexual differentiation of joints affected with osteoarthritic changes are interpreted in previous studies as due to differences in activities performed by the different sexes (i.e. Eshed *et al.* 2010: 129; Larsen 1997:176-178). Osteoarthritic changes were observed on the bones of the ankles of the females from Souskiou-*Laona* and Kissonerga-*Mosphilia* exclusively and only the females from Souskiou-*Laona* displayed osteoarthritic changes to the hip and knee. Females in general at Souskiou-*Laona* display more variety in the joints affected by osteoarthritic changes than any other group, with the knees and hips affected[95]. In summary, both sexes display osteoarthritic changes of the vertebrae, elbows and hands, though in varying percentages at different sites. The males at Souskiou-*Laona* and Lemba-*Lakkous* display higher prevalences of osteoarthritic changes to the vertebrae and hands than females, which the opposite is true at Kissonerga-*Mosphilia*. Degenerative changes to the elbow are present amongst females at Souskiou-*Laona*, males at Lemba-*Lakkous* and not present at Kissonerga-*Mosphilia*. The lack of statistically significant differences in degenerative changes to the specific joints based on sex is most likely due in part to the small size of the samples and a general a lack

[94] Weiss and Jurmain note that sex differences in the expression of osteoarthritic changes may not strictly be limited to the differences in activities but may actually be related to hormones, body size, genes and anatomy (2007: 444).

[95] This agrees with previous studies which indicate that females display more osteoarthritis in the lower limbs than the upper limbs (Weiss and Jurmain 2007: 440).

of sexual disparity of osteoarthritic changes. It is perhaps of greater value to note the trends in the expression of the osteoarthritic changes.

Many clinical studies seem to focus on osteoarthritis to the knees and vertebrae in particular, due to their high levels of involvement with weight-bearing and movement (i.e. Beattie *et al.* 2005; Maksymowicz *et al.* 2004; Meredith *et al.* 2009; Szebenyi *et al.* 2006). It seems that in general, modern clinical studies of osteoarthritis focus on the elderly as the changes to the articular surfaces are age-related. The weight-bearing joints, the knee and hip, tend to display higher prevalences of degenerative changes at earlier ages than the non-weight-bearing joints (Konno *et al.* 2002: 72). The extremely poor preservation of these joints within the Chalcolithic Cypriot skeletal samples most likely has an impact on the results distribution of osteoarthritic changes within the populations.

Previous studies have examined how specific activities can correlate to specific joints affected by osteoarthritic changes (i.e. Jurmain 1999; Oates *et al.* 2008; Sofaer Derevenski 2000)[96]. However, these are population specific and as many activities place a heavy workload on the same joints it is difficult to determine exactly what activities lead to which degenerative changes on a specific joint. The archaeological data which can be used to discuss the activities in which the living population would have participated is predominately drawn from the excavations at Kissonerga-*Mosphilia*. However, there may be some differences in requirements based on geographical location of the living population (see below). Based on the archaeological evidence, the Chalcolithic populations were engaged in hunting (possibly involving spear throwing or use of a sling) and gathering (of naturally occurring fruits, nuts and cereals), food processing (represented by quern stones, rubbers, mortars and pestles for example), private and public works (including digging, building, terracing) for the construction of round houses with stone foundations and mudbrick walls, burials and possibly community buildings, as well as tree felling for use in building and fires, production of large ground stone tools,

[96] Accentuated entheses or musculoskeletal stress markers (MSM) can also be used to discuss various activities performed in archaeological skeletal samples based on the differential appearance of muscle attachment sites on the human bones. It is often possible to discuss differentiation between the sexes in regards to a division of labour based on these markers (i.e. Eshed *et al.* 2004a; Hawkey and Merbs 1995; Kennedy 1989; Wysocki and Whittle 2000).

agricultural labour (sowing, reaping), production of lime plasters, mudbricks, pottery, smaller ornaments such as figurines and beads and a multitude of other tasks which would have occurred routinely[97]. Each of these activities utilises specific muscle groups and places workload stress on specific bones and joints which can eventually lead to changes in the bone structure (MSMs) or degeneration of the joint surface.

While both Kissonerga-*Mosphilia* and Lemba-*Lakkous* are located in similar geographical locations (i.e. on slight hills overlooking the coast with water sources relatively nearby and generally rather gently rolling terrain), Souskiou-*Laona* and the associated settlement is located in the foothills of the mountains, on a rather steep ridge with some distance to the nearest water source (Crewe *et al.* 2006; Peltenburg *et al.* 2005). While it is still not clear how much the landscape has changed in this region, it must be noted that those inhabiting the Souskiou-*Laona* ridge would have had to walk down and then back up a hill to access their water. There is no place for widespread crop cultivation on the ridge however there is evidence for grain processing in and around the settlement (Peltenburg pers. comms) and the houses, while similar in construction to those at the other Chalcolithic settlement sites would likely have required more extensive terracing into the slope. These aspects of location would have an impact on lifestyle, which seem to indicate that hill-walking would have played a large role in the daily lives of the inhabitants of the Souskiou-*Laona* settlement. This would possibly affect the specific joints affected by osteoarthritic changes and trauma.

Knowing some of the activities that the Chalcolithic populations regularly participated in then, can a correlation be made to the osteoarthritic changes observed on the skeletons? While it is not possible to make concrete statements, the patterns of osteoarthritic changes can possibly suggest where some of the divisions may lie. For example, only males display osteoarthritic changes to the shoulder joint, which possibly correlates to the throwing of a spear or stone for hunting purposes or heavy lifting (Jurmain 1991). There was no difference in the prevalence of osteoarthritic changes to the shoulder according to side (which may be reflective of a limited sample size due to preservation and that only in rare cases were articular surfaces

[97] For more information on all these aspects of Chalcolithic life please refer to Peltenburg *et al.* 1985, 1998, 2005 and for a brief synopsis see Croft 1999 or Steel 2004: 83-118.

from both shoulders of an individual present). Perhaps the similarity in degenerative changes to the hands and elbows between males and females reflect shared tasks such as grain processing (using a quern stone and rubber) or pottery production or different tasks with a similar stress factor on those particular joints such as mudbrick and lime plaster making and laying versus fire making and gathering[98]. The higher prevalence of osteoarthritic changes to the feet amongst females at all three sites possibly reflect either heavier loads being carried or more walking being done by these individuals (Buckwalter and Lane 1997: 80).

It is unfortunate that the vertebrae do not survive in better preservation as much information in regards to load bearing and the nature of labour can be discussed based on pathologies to the spine (i.e. Faccia and Williams 2008; Molleson 1994; Sofaer Derevenski 2000). The pathologies observed on the vertebrae, in most cases, likely represent overall wear and tear due to age and activity. While there are likely far more occurrences of labour-related lesions, vertebral bodies do not survive in complete enough condition to be able to identify them conclusively. Within the Chalcolithic populations, both males and females display osteoarthritic changes to the vertebrae. Much attention has been paid to the changes in work-load at the advent of agriculture in the Levant and it is from these studies that perhaps correlation can be drawn in regards to the division of labour based on sex (i.e. Cohen and Armelagos 1984; Eshed *et al.* 2004a,b, 2010; Larsen 1995).

4.3.1 Bone Elements with Osteoarthritic Changes

Each bone was analysed for the prevalence of osteoarthritic changes based on proximal or distal articular surface. As this provides a much larger sample size, particularly at Souskiou-*Laona*, it changes some of the general patterns. However, because these bones are not able to be provided with an age or sex estimation, comparison can only be based on burial location and general observation of the prevalence of osteoarthritic changes. The prevalence of osteoarthritic changes to the foot phalanges at Souskiou-*Laona* is much higher than at the settlement sites, particularly in regards to the distal phalanges. In this case, geography and excavation recovery likely play a role in the observed expression. The hilly and steep nature of

[98] Waldron's study on osteoarthritis of the hands indicates that the females tended to display a higher prevalence with more joints within the hand affected (1993).

the land around Souskiou would put more loading stress on the feet, knees and hip which could in turn create a higher prevalence of osteoarthritic changes to the joints (Buckwalter and Lane 1997). In general, the foot phalanges were not well recovered from the settlement sites. This is likely due to two factors, the excavation methodology and the movement of human remains amongst graves around the site at the settlements during the Chalcolithic period.

The first and second cervical vertebrae were analysed independently from the other vertebrae and revealed that a fairly high percentage of all three populations are affected with osteoarthritic changes to the articular facets. These changes are most likely due to general wear and tear from daily activities (Kettler *et al.* 2007). There is no specific aetiology and in general the changes tend to be quite mild osteophytic growth along the edges of the articular facets. The scapulae and the clavicles from Lemba-*Lakkous* display significantly higher prevalence of osteoarthritic changes which indicate that the individuals from this site likely had more stress on their shoulders than the other two sites. Interestingly, there are very few lower limb long bones which display osteoarthritic changes at any of the sites, and particularly at Lemba-*Lakkous*. However, given the poor preservation of the articular surface of the lower limb bones at all three sites, observations of osteoarthritic changes are limited. Therefore, despite the reliance on foot for transportation, the prevalence of osteoarthritic changes to the hip and knee is likely artificially low based on a very limited sample (i.e. Buckwalter and Lane 1997: 81; Mündermann *et al.* 2005).

Overall, there are a limited number of cases of osteoarthritic changes to the joints of the three Chalcolithic populations. However, preservation of the articular surfaces of the joints was fairly limited. It is interesting to note that there are significant differences in the joints affected based on sex. While theses differences support a division of labour based on sex, there is nothing to indicate a social stratigraphy as presented by Peltenburg (2002– see below section for further discussion). Based on the trends of the differences observed in the expression of osteoarthritic changes on the joints, the division of labour based on sex is relatively similar across all three sites. It is difficult to ascertain what those tasks may have been for the different sexes, but both sexes seem to be involved in routine activities which placed stress on their bodies. There also seems to be an indication that terrain and location have played a role the expression of osteoarthritic changes to the different skeletal samples, based on the osteoarthritic changes to the foot phalanges.

The severity of the osteoarthritic changes and the implications for the individuals suffering with these pathological changes varies both within and across the sites. In general, most lesions on the joints are mild to moderate and in many cases would not affect the individual's general health status or ability to function. Clinical studies of osteoarthritis indicate that osteophytes do not necessarily result in pain for the individual. Pain is more often registered when there is subchondral sclerosis to the bone at the joint and evidence of eburnation where the bones have been in contact (Szebenyi *et al.* 2006: 234). These pathologies could not be assessed within the Chalcolithic skeletal samples and therefore it becomes more difficult to comment on the quality and quantity of pain. Clinical studies of osteoarthritis and pain have been conducted to try to establish general scales for pain and degenerative changes. However, this varies from joint to joint and individual to individual (Beattie *et al.* 2005; Szebenyi *et al.* 2006 and references within). One study indicates that osteophytes on the joints are present in asymptomatic individuals, thus this particular pathology may not necessarily present pain to the individual (Beattie *et al.* 2005: 184; Stevens and Strand Viđarsdóttir 2008). Therefore, in regards to the Chalcolithic populations, with some exceptions, the osteoarthritic changes observed would not have been debilitating to the individuals affected. There are several exceptions from each site where an individual displays a much more ubiquitous expression of osteoarthritic change across several joints[99]. The most severe case, possibly representing ankylosing spondylitis (AS)[100] occurs at Souskiou-*Laona* (Skeleton C Tomb 200) where all the vertebral groups display evidence of osteoarthritic changes and the cervical vertebrae are ankylosed together.

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[99] See the discrete skeleton descriptions for Skeleton C Tomb 200, Skeleton A Tomb 192, Skeleton A Tomb 201 from Souskiou; Grave 53, Grave 30 and Grave 26 from Lemba and Skeleton A from Grave 526 from *Mosphilia*.

[100] 'Ankylosing spondylitis (AS) is a systemic, progressive, non-infectious, inflammatory disorder of connective tissue calcification involving the spine, sacroiliac and major peripheral joints' (Aufderheide and Rodriguez-Martin 1998: 102). While AS typically affects the sacroiliac joint first, these articular surfaces are not preserved to any great degree. It is interesting to note that Skeleton C Tomb 200 also displays the possible congenital anomaly of a transitional sacral vertebra, and it may be that this defect had lead to the fusion of the cervical vertebrae and AS is not present. This presents a differential diagnosis of the fused cervical vertebrae (and other osteoarthritic changes) as either relating to the transitional sacral vertebra resulting in degenerative joint disease or AS.

4.4 Trauma

The assessment of injury (either accidental or violent) within a population can facilitate the discussion of environmental, cultural and social influences on behaviour (Larsen 1997: 109). Within the Cypriot Chalcolithic collections studied here, trauma seems to be accidental and typically takes the form of a healed fracture or a disruption in nerve and/or blood supply which has caused a lesion on the bone. Perimortem trauma is very difficult to identify within this skeletal material due to the high levels of fragmentation. Overall, there is very little trauma observed across the three sites, with only 3.9% of all the discrete articulated skeletons affected, all of which are skeletally mature. However, as Ortner (2003:119) points out, skeletal evidence of trauma in subadult skeletons may be completely obliterated in the process of growth, and in general, he states that the actual prevalence of trauma in the living population will be underestimated. There are a greater number of individuals displaying evidence of trauma at Souskiou-*Laona* than at the other two sites, with 19.4% of the discrete skeletons displaying at least one incidence of trauma, compared to 4.3% at Lemba and 1.4% at *Mosphilia*. The frequencies observed at the settlement sites are closer to those recorded for the Natufian (3.5%) and Neolithic (3.9%) populations from the Levant (Eshed *et al.* 2006: 126 – see above for rational for selecting these populations for comparison). Larsen discusses the association of accidental injury with subsistence strategy and determines that there is high variability of injury both spatially and temporally across the archaeological skeletal samples (1997:118). The activities participated in and the environment of a particular individual will dictate their risk factor for injury. It seems possible that terrain may impact the prevalence of trauma at Souskiou-*Laona*.

Not only is the prevalence higher at Souskiou-*Laona*, the severity of the trauma is greater than at the settlement sites. The only evidence for long bone fracture from all three sites is from Souskiou-*Laona*. There is an interesting correlation between the severity and extent of osteoarthritic changes observed on two of the individuals from Souskiou-*Laona* and severe trauma to an upper limb bone[101]. There is no statistically significant difference in the prevalence of trauma between the sexes which differs from the results obtained in the Natufian and Neolithic populations where males tend

[101] Skeleton A Tomb 192 and Skeleton A Tomb 201.

to display a higher prevalence (Eshed *et al.* 2006: 126-127). There was no trauma observed on any of the subadult skeletal material.

4.4.1 Bone Elements with Trauma

When the prevalence of trauma is assessed by specific bones, there are limited types of bones which are affected. While other studies have focused on trauma to the cranium, there was only one incident of possible trauma from Souskiou-*Laona* to any of the cranial bones observed (i.e. Eshed *et al.* 2010: 126; Lovell 1997). This individual displays a small depression ectocranially on the parietal for which there is no sign of fracture. The only long bones which display evidence of trauma are the radii, tibiae and fibulae, all of which occur at Souskiou-*Laona* with the exception of a tibia from Lemba-*Lakkous* which displays woven bone (subperiosteal thickening) from a disruption to the nerve and/or blood supply most likely due to blunt trauma. Of the two radial fractures, one represents a distal radial fracture (caused when an individual tries to break a fall by thrusting the arms forward, possibly a Colles fracture) where the re-alignment in healing is nearly perfect though the bone is shortened. The other fractured radius (a possible parry fracture as the fracture occurs mid-diaphysis caused by warding off a blow or accident) displays evidence of a chronic infection from the fracture. This most likely would have resulted in limited use of the limb which is evidenced by the smaller size of the articulating bones compared to the opposite arm. There is also one case of a possible broken ankle at Souskiou-*Laona* where a tibia and fibula have fused at the distal end of the bone. However, the bone is highly fragmentary making it impossible to assess the extent of the callous or possible fracture.

There are several intermediate and distal foot phalanges from Kissonerga-*Mosphilia* and Souskiou-*Laona* which are ankylosed together representing either an incident of trauma, possible ankylosing due to osteoarthritic changes or perhaps a hereditary trait (noted for affecting the fifth ray bilaterally). In some cases, it is difficult to determine the cause of the morphological changes observed, particularly in the phalanges where the morphology is obviously altered but without a radiograph is it not possible to determine whether trauma has played a role. At Souskiou-*Laona*, there are two cases of trauma to the proximal hand phalanx, where a fracture has healed and formed a bony callous. In one case, this is in the form of a Boutonniere deformity caused by trauma or progressive osteoarthritis, resulting in a permanently fixed pose for the digit (Likes and Ghidella 2010). The other case displays a large healed cloaca caused by infection more likely from a fracture which would have limited the use of this digit.

Trauma in prehistoric populations is difficult to compare in regards to frequency as it is very much dependent on lifestyle, so where there are variations in activity and interpersonal relations, the levels and types of trauma will be affected (Aufderheide and Rodriguez-Martin 1998: 19). The limited number and types of cases which were observed across all three Chalcolithic sites seems to indicate that there was no serious interpersonal violence within or amongst the populations. The trauma observed seems accidental, particularly since much of it is focussed on the feet, reflecting perhaps walking with inappropriate footwear over rough terrain or simply stress and wear on the joints due to repetitive heavy use. That most of the bones with evidence of trauma and certainly the most severe cases of trauma occur at Souskiou-*Laona* is interesting. It could simply be a reflection of the greater number of skeletally mature individuals involved in activities which placed them at greater risk of injury within the sample, or it could indicate aspects of a rougher and more difficult lifestyle or environment which has lead to more accidents resulting in skeletal trauma.

4.4.2 Infections

There are only a limited number of cases of infection within the Chalcolithic skeletal material. A cloaca at the site of trauma occurs in at least three occasions (as discussed above). There is one case from Souskiou-*Laona*, where woven bone in the sinus cavity of the maxilla possibly indicates a chronic sinus infection. Infection of the bone will often cause pain as the build-up of pressure from the pus irritates the healthy tissue around the point of infection. In some cases, this may affect the ability to use the infected body part. And, an infection untreated, can sometimes lead to death. An extreme example of this occurs in the individual from Grave 571 from Kissonerga-*Mosphilia* where numerous apical cavities most likely reflect abscesses, which had progressed to osteomyelitis and may have played a role in the individual’s death.

4.5 Disease and Disorder

As noted in Chapter Two, disease and disorder here refer to a select group of osseous changes which could have resulted from any number of possible diseases or disorders from infectious, metabolic, hematopoietic, vitamin or mineral deficiencies or even parasitic aetiologies. There is a difference between the expression of the pathological indicators of a possible disease or disorder across all three sites amongst the discrete skeletons. Several specific bones are most useful in the assessment of possible indicators of a disease or disorder, including the cranium and the long bones of the legs. This is reflected in the examination of the skeletal material by bone element, where only the frontal bones, tibiae and femora are affected. Overall, the discrete individuals from Lemba-*Lakkous* display the highest prevalence of indicators of disease or disorder at 11.3% of all individuals.

When the individuals with evidence of a disease or disorder are grouped based on age, overall the majority of discrete individuals are under the age of 21 years at death. The skeletal sample from Kissonerga-*Mosphilia* displays the highest percentage of subadults with indications of disease or disorder at 12.2% of the subadult sample compared to 4.5% at Souskiou-*Laona* and 8.8% at Lemba-*Lakkous*. This indicates that individuals who display evidence of disease or disorder are surviving long enough for the disease to manifest itself in the bones, but dying at a relatively young age. As Lunt has indicated, infant mortality was high during this period and given the prevalence of disease and disorders affecting the subadult population across all three sites, but particularly at the settlements, the variety of diseases and disorders which could have affected these individuals must be considered (Lunt 1985: 246).

In general, there is a low frequency of indicators of disease or disorder within the adult populations from the Chalcolithic period. While females are the only adult discrete skeletons with evidence of disease or disorder, there is no statistically significant difference in the expression of these lesions based on sex. This seemingly has a comparison with Eshed *et al.*'s study where the females display a higher prevalence of 'inflammatory lesions' than males in the Neolithic period (2010:127-128). Their study also indicates an increase in disease prevalence for both sexes from the Natufian to the Neolithic populations, reflecting the correlation between diseases and agriculture (Eshed *et al.* 2010: 128). The comparison is made between the Chalcolithic populations and the Levantine populations due to their geographic proximity and possible similarities in environmentally influenced diseases (i.e.

various anemias as a reflection of malarial landscapes or infectious diseases ~ see below).

So what kinds of disease and disorder may have been present during the Chalcolithic period which could have resulted in the lesions observed on the skeletal remains? Given that Cyprus is a malarial country, malaria and hence sickle-cell anaemia or thalassemia were most likely present (Angel 1966, 1978; Lagia *et al.* 2007). Other infectious diseases were undoubtably present and cannot be entirely ruled out. Archaeological evidence from the early part of the Chalcolithic period seems to indicate relative regional isolation (Peltenburg 1991a: 107). However throughout the Middle Chalcolithic foreign and inter-site contacts developed which likely represented higher population mobility and thus greater opportunity for the contraction and spread of infectious diseases (Peltenburg 1991a, 1993). Palaeoparasitological studies from the preceding Neolithic period indicate that parasites affected the individuals due to food, lifeways and environmental factors (Harter-Laillheugue 2005). While there haven't been any palaeoparasitological studies yet from the Chalcolithic, it is possible that similar parasites also affected the populations from this period. As the Chalcolithic people were involved in herding and consumed domesticated animals they were in close proximity to animals which will lead to the transmission of zoonotic diseases such as tuberculosis, echinococcosis and brucellosis and are observed in twentieth century Cypriot populations. However, there is no conclusive evidence of these diseases in the prehistoric (or even Hellenistic-Roman) populations (Fox 2005: 77) despite their possible close contact with animals. Other metabolic diseases cannot be ruled out despite the varied diet consumed by the Chalcolithic people.

4.6 Congenital Defects

While there are a vast number of different congenital defects which can affect the bones, there are very few defects observed on the human remains from the three sites examined[102]. Possible congenital absence of the third molars was observed at all three sites. The only post-cranial congenital defect observed is the possible non-fusion of sacral vertebrae, creating a transitional sacral vertebra (Aufderheide and Rodriguez-

[102] See Aufderheide and Rodriguez-Martin 1998: 51-76; Waldron 2009: and Ortner 2003: for a comprehensive list and discussion of the varieties of congenital anomalies which can affect humans.

Martin 1998: 65-66). It can be difficult to assess the presence of a transitional sacral vertebra when the spine is not completely preserved (Dastugue and Gervais 1992). Therefore, the assessment given here is somewhat tentative as none of the sacra assessed with a transitional vertebra were part of a complete spine, or even a complete sacrum. Clinical studies indicate that a transitional vertebra can lead to osteoarthritic changes to the rest of the spine and a lack of stability throughout the back which does not typically have severely debilitating ramifications for the individual (Aihara *et al.* 2005; Kanchan *et al.* 2009). Therefore, while likely not to have a great impact on the individual, the appearance of this congenital anomaly may reflect genetic ties amongst the individuals with the defect (Kanchan *et al.* 2009). Possible transitional sacral vertebrae occurred in three incidences at Souskiou-*Laona*, two of which were from the same burial context (see Figure 3.90). As this is an inherited trait, it may tentatively reflect familial connections within and between the tomb groups at Souskiou-*Laona*.

4.7 Discussion of Health and Disease in the Chalcolithic Period by Site

4.7.1 Souskiou-Laona

The general demographic profile for the individuals who were buried at Souskiou-*Laona* indicates a predominately skeletally-mature population, with few subadult individuals within the sample. It is rather difficult to discuss the prevalence of pathology amongst the subadults from Souskiou-*Laona* as most remains were recovered from the commingled bonestacks. Therefore the focus of the study on the pathologies expressed is on the skeletally-mature bones. Of the adult population at Souskiou-*Laona*, 59.4% have a sex assessment of female or possibly female. The general health status profile seems to indicate fairly low levels of pathology within the population when examined by bone element. The prevalence of a particular pathology increases when just the discrete skeletons are considered, as the results are impacted by sample size and preservation issues which have made the prevalence higher per joint. When the minimum number of individuals affected by a particular pathology is tabulated based on burial context, the overall low prevalence of pathological lesions is clear in most cases.

4.7.1.1 Dental Disease

Overall, the evidence from dental disease indicates that the adult population at Souskiou-*Laona* suffered from dental caries, calculus, heavy attrition and likely some periodontal disease, in the form of alveolar recession and ante-mortem tooth loss. The females tended to have a slightly greater prevalence of dental caries which may reflect a diet with more cariogenic foods or a greater susceptibility than males, while males have a slightly higher prevalence in the expression of calculus, possibly suggesting higher consumption of animal and/or agricultural products or differences in oral hygiene or susceptibility. The discrete female skeletons in general display slightly higher prevalence of most dental pathology than the males which can either represent a general great susceptibility based on enamel composition or actual differences in diet, food preparation or consumption or oral hygiene. As LEH is used as a non-specific indicator of general health status, the low prevalence of observed LEH within the Souskiou-*Laona* skeletal sample would seem to reflect a population that did not experience a great deal of physiological stress as the teeth were developing. It is unknown whether the teeth simply did not reflect the physiological stresses experienced in childhood, stresses were not suffered in childhood or those that experienced stress were killed by it in childhood and thus do not display LEH. When examined by disease and tooth position there are some patterns in pathological expression amongst the permanent teeth derived from Souskiou-*Laona*. The mandibular teeth tend to display slightly higher prevalence of calculus, while the maxillary teeth seem to exhibit higher prevalences of caries, LEH and ante-mortem tooth loss. The anterior teeth of both jaws display higher prevalence of calculus and the posterior teeth exhibit higher prevalence of caries.

4.7.1.2 Osteoarthritic Changes

There is a greater variety of joints affected by osteoarthritic changes at Souskiou-*Laona*, particularly amongst the females, than the other two sites. This may indicate that females participated in a wider variety of activities. In general, there are low few occurrences of osteoarthritic changes to the epiphyses of the long bones, particularly the lower limb long bones. However, the bones of the feet, particularly the toes, display a relatively high prevalence of osteoarthritic changes. Most likely the poor preservation levels for the articular surfaces of the lower limb long bones have artificially lowered the frequencies. Terrain also likely played a role in the pattern of expression of osteoarthritic changes at Souskiou-*Laona*. The steep, hilly landscape and the location of the settlement on the edge of a ridge would likely have entailed much more walking up and down inclines which puts greater stress on the feet, knees and hips. Only individuals from Souskiou-*Laona* display evidence of osteoarthritic changes on the knees and hips. Of the tarsals, the navicular displays the highest prevalence of osteoarthritic changes at 12.8%. The navicular provides movement in the flexion of the foot at the ankle used when walking or climbing. However the osteoarthritic changes affecting the tarsal are typically mild and likely would not have had much of an impact on the use or movement of the joint. The fifth and first metatarsals display the highest prevalence pathology, in the form of either trauma or osteoarthritic changes. This is not unexpected given their location in the foot and role in balance and mobility. The foot phalanges derived from Souskiou-*Laona* display the highest prevalence of pathology, particularly osteoarthritic changes and trauma, than any other joints. While often quite mild in expression with little osteophytic growth, given the generally low prevalence of osteoarthritic changes at Souskiou-*Laona*, the frequency of pathology becomes more significant.

The osteoarthritic changes to the upper limb long bones at Souskiou-*Laona* are concentrated on the elbow joint. With a couple exceptions, the osteoarthritic changes observed on these bones are fairly mild, with minor osteophytic growth at the edges of the articular surfaces or remodelling of the articular facets. Based on clinical studies it seems likely that these observed pathologies would not have had a serious effect on the use of the joint (Szebenyi *et al.* 2006). However it does indicate a use of the upper limbs in a way which has put extra stress on the elbow joint causing changes in the articulation which are not observed with the same frequency in the wrist or shoulder. The hamate displays the highest prevalence of osteoarthritic change of all the carpals at Souskiou-*Laona*, followed closely by the capitate. Thus it is the movement of the medial half of the hand-wrist which seems would have been most affected by the osteoarthritic changes observed on the carpals. However, when the metacarpals are examined, the first metacarpal displays the highest percentage of osteoarthritic changes of all the metacarpals at 18.3% with pathology. The prevalence of pathologies affecting the hand phalanges is very low at Souskiou-*Laona*. Given the variety of bones affected and the low frequency of occurrence, it is impossible to establish which activities may have impacted the expression of pathology.

Different body parts are affected with osteoarthritic changes divided by sex estimation at Souskiou-*Laona*. A higher percentage of females display osteoarthritic changes to the elbow, ankle, foot, wrist and hip than males, while a higher percentage of males display osteoarthritic changes to the vertebrae, hand, shoulder and ribs than females. While a direct correlation between osteoarthritic changes and activities is not possible, given the low prevalence of osteoarthritic changes on the joints of the skeletal remains derived from the site, it seems noteworthy to observe these patterns between the sexes. The lower limb is more often affected in females at Souskiou-*Laona*, which agrees with previous studies of sexual disparity in evidence of pathologies linked to labour in agricultural communities. The subsistence economy of the individuals derived from Souskiou-*Laona* was likely quite diverse, based on previous studies from the Chalcolithic period, reflecting a division of labour between sexes in communities with a mixed economy (i.e. Eshed *et al.* 2010).

4.7.1.3 Trauma

Trauma was observed on a minimum of 13 individuals, or 10.4% of the entire mortuary population derived from Souskiou-*Laona*. The trauma seems to have been focussed on the foot, hand, wrist/arm and ankles. All of these cases most likely reflect accidental injury rather than interpersonal violence (i.e. Likes and Ghidella 2010; Ortner 2003: 138; Waldron 2009: 151). Two cases display clear evidence of infection due to trauma with mal-fused ends of the bone creating a cloaca in the bony callous. The low occurrence of evidence of infection due to trauma is to be expected within archaeological skeletons, as likely, infection would have killed the individual before an osseous reaction (Ortner 2003: 153). There is one case where the tibia and fibula have ankylosed which could have affected the individual's locomotion, although its presence indicates survival post injury (Ortner 2003: 157). There are a few cases of trauma within the Souskiou-*Laona* skeletal sample which would have significantly impaired the function of a particular body part. This disability, in some cases, would have required aid from other members of the community. For example, Skeleton A from Tomb 201 exhibits the mal-healed fracture of the radius which had become infected and almost certainly prohibited the use of the right arm.

4.7.1.4 Disease or Disorder

There is very little evidence of diseases or disorders amongst the Souskiou-*Laona* skeletal sample with only three (2.4%) individuals displaying indications of disease. It is possible that there were only limited occurrences of disease amongst the population, but there are other factors at Souskiou-*Laona* which likely affect the observed prevalence. The surface preservation of the bones makes lesions difficult to recognize and diagnose and the fragmentary nature of the bones make morphological variations impossible to assess. As well, the commingled context makes it impossible to examine entire skeletons in most cases, therefore limiting the ability to diagnose a disease. Finally, selective burial practice must be considered, where perhaps those with a particular disease were not included within this cemetery. In general then, all that can be observed for this particular skeletal group is a very low prevalence of evidence of vitamin or mineral deficiencies, metabolic, infectious, hematopoietic or parasitic diseases or disorders. Further work on palaeoparasitology from the site will more clearly elucidate the possible disease causes within the population. Previous study of other populations in the region indicates a higher percentage of the community affected by disease in prehistoric populations (i.e. Eshed *et al.* 2010: 129).

4.7.1.5 Congenital Defects

The only congenital defect observed at Souskiou-*Laona* (or any of the sites within this study), with the exception of possible congenitally absent teeth, is a delayed or non-fusion of a sacral vertebrae. This occurs in 8.3% of the adult population where sacra were recovered. Only 38.4% of the overall population were recovered with a sacrum. Three of the four cases of a possible transitional sacral vertebra observed occur with male sacra. This may represent an inherited defect and given that two of the four observed cases occur in the same tomb context (Tomb 158), it may indicate a possible genetic connection amongst the groups within the tombs. This is unconfirmed and given the condition of the sacra the diagnosis must be approached with caution. Transitional sacral vertebrae do not typically cause any functional impairment for the individual as the only possibly related pathology is an increased chance of osteoarthritic changes to the rest of the spine (Aihara *et al.* 2005).

4.7.1.6 Conclusions

There are several tombs which stand out from the others in regards to the number and types of pathologies observed within the closed context of the tomb. Tombs 125, 158, 165, 192, 200, 220 and 228 present a variety and relatively large number of pathologies with fairly high MNI's per tomb[103]. There is no spatial relationship amongst these tombs in regards to the cemetery plan. At this stage of the research into the burial practices and mortuary population at Souskiou-*Laona* it is difficult to make many conclusions regarding the individuals within the tombs. Each tomb may contain individuals representing, for example, a different familial, kin, trade or economic group within the mortuary population from this site. However, interpreting the pathologies has not indicated conclusively, at this point, what the connection amongst the individuals within a tomb may be. Crewe *et al*. have begun the analysis of these tombs by examining the burial practice and this study on the palaeopathology, along with further artefact and tomb architecture studies will be able to elaborate on this preliminary paper to present interpretations regarding the distribution of the mortuary population (2005; Toumazou 1987 for discussion of tomb construction).

The overall health of the population as determined by the pathologies observed on the skeletal material from Souskiou-*Laona* reflects a population which did not suffer many severe health problems. The osteoarthritic changes tend to be rather mild in nature and the low level and types of trauma indicate accidental rather than violent causes. As well, the evidence for infectious, metabolic, hematopoietic or parasitological diseases is limited and, while dental disease is present, it is in most cases mild and not debilitating to the individual. The large young adult population within the cemetery skeletal sample indicates that the individuals were generally not living much past thirty years of age, and more frequently were dying in their early twenties. However, as is usual in archaeological skeletal samples, the cause of death of an individual is not typically discernable. In preindustrial societies, an early age of death is not uncommon, where the stress of childbirth and the dangers of hunting were causes of early age at death (Boldsen 2007: 64; Preston 1997:30; see Chamberlain 2006: 64-68, 81-84 for discussion on demography of archaeological populations with

[103] Please refer to the tomb and individual descriptions in Appendices D and E for more information regarding the pathologies observed within the tombs and the minimum number of individuals and also Table 3.324 in Chapter 3.

agriculture). These causes may represent a portion of the young adults within this sample where no observable lesions indicating cause of death were left on the skeletons. The relatively small subadult sample at the cemetery is interesting. This likely reflects a different burial practice for the majority of the subadult individuals within this population[104] and indeed variations in burial practice amongst the living population will impact any interpretations regarding the society as interpretations can only be based on the mortuary population present. However, the inclusion of some subadults from all age ranges may mean that there is some culturally imposed rules about who is buried within the cemetery. This kind of belief system has not left any archaeological evidence and is strictly conjectural but would perhaps indicate a great deal about the cosmology and religious beliefs of the population (Parker Pearson 1999).

<u>4.7.2 Lemba-Lakkous</u>

The general demographic profile for the individuals buried within the Lemba-*Lakkous* settlement site reflects a predominately subadult mortuary population as 63.9% of the skeletal sample has an estimated age below 12 years at death. Just over half (52.6%) of the adult skeletons observed have an assessed sex of female or possible female. Given the large subadult population, it seems likely then that there was a different burial custom or location for the majority of the adult population from the settlement site[105]. The general health status of the skeletal population from Lemba-*Lakkous* is quite good overall, with low prevalence of most pathological lesions on a bone-by-bone basis. This prevalence becomes slightly higher when the discrete skeletons are analysed for pathology. The greatest hindrance for the palaeopathological analysis at Lemba-*Lakkous* is the state of preservation of the bones. A combination of burial practice, taphonomy, excavation methodology and curation of the skeletal remains has significantly damaged many of the bones. As well, the movement of the skeletal remains, the taphonomic damage and excavation has resulted in very incomplete discrete skeletons, in particular the small bones of the hands and feet are absent.

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[104] It must be noted here that the commingled remains from fills above the main burial level were not included within this study and there is a high likelihood that the number of subadults within the cemetery population will increase when these are included.

[105] As Peltenburg has suggested earlier, there was possibly a cemetery site somewhere outside of the village (1985) or perhaps the disposal of the dead adults involved a practice which destroyed the body (i.e. cremation with spreading of the remains, exposure and destruction of the bones, sea or river burials).

There were no pathologies observed on any of the os coxae, sacra, ulnae, first ribs, metacarpals, proximal and intermediate hand phalanges, femora, tarsals, metatarsals, intermediate and distal foot phalanges. Most of these bones had very limited recovery or survival. Therefore, when pathology is observed, the percentage of affected elements is artificially high due to the limited recovery of each bone. When examined by burial context, it possibly reflects a closer approximation of the prevalence of particular pathologies.

4.7.2.1 Dental Pathology

The individuals derived from the Lemba-*Lakkous* settlement site display evidence of dental pathology in the form of dental caries, calculus, LEH and ante-mortem tooth loss. The prevalence of dental caries is similar to that at Souskiou-*Laona*, particularly amongst the females, which may represent a similar consumption of cariogenic foods for select groups within populations. The prevalence of calculus is fairly low across the site. However, this may be a problem with preservation where the calculus has been lost post-mortem. In general, the mandibular teeth display a higher percentage of teeth with dental disease than the maxillary teeth at Lemba-*Lakkous*, with more mandibular teeth displaying calculus, caries, LEH and higher levels of ante-mortem tooth loss. A higher percentage of maxillary teeth are heavily worn. Previous studies have indicated that this is a common trend in most regards, except, typically higher levels of attrition are observed on the mandibular teeth as well. There is only one observed apical cavity in a mandible, generally indicating that perhaps dental disease was not particularly prevalent within the Lemba-*Lakkous* population. That calculus is most prevalent on the third molars is unusual and most likely can be explained by the low sample size as there is no statistically significant difference amongst the teeth in regards to calculus expression. Beyond that, the pattern of dental pathological expression is similar to that of Souskiou-*Laona* with LEH affecting anterior teeth, attrition affecting the premolars and caries affecting the posterior teeth. In general, the prevalence of the various dental pathologies within the Lemba-*Lakkous* sample are quite low.

4.7.2.2 Osteoarthritic Changes

The prevalence of osteoarthritic changes on the various articular facets are generally quite low. This is again correlated to the poor preservation levels of the epiphyses and small bones as 27.3% of the discrete skeletal population do not have a single articular surface present. When considering the discrete skeletons, the vertebrae are the most affected joint with 56.3% of those recovered with intact vertebrae displaying some form of osteoarthritic change. Osteoarthritic changes to the spine tend to reflect general wear and tear but there is no way to establish which activities may cause the degenerative changes. Therefore, the osteoarthritic changes observed simply indicate that over half the population was engaged in some form of activity which led to degenerative changes to the vertebrae. The first and second cervical vertebrae in particular display osteoarthritic changes to the articular surfaces. These tend to be mild in expression and it seems likely that they would not have had a great limiting impact on the individual's movement. As the estimated age increased, the prevalence of osteoarthritic changes also increased, with the most extensive case of osteoarthritic changes on the individual from Grave 26, who displays degenerative changes to the cervical and thoracic vertebrae, several rib fragments, both scapulae, both radii, the left humerus and right clavicle.

There is a clear split in the osteoarthritic changes affecting each sex, with only males displaying degenerative changes to the ribs, hands and shoulders and only females displaying changes to the feet and wrists. Males display a higher prevalence of degenerative changes than females to the vertebrae and elbows. The reason for these observed differences in osteoarthritic expression may relate to a division in labour between the sexes at Lemba-*Lakkous*. It is not possible to specify which activity may lead to a particular lesion location. However, the mixed subsistence economy evidenced by the archaeological evidence provides different tasks which could have led to the eventual osteoarthritic changes observed.

When each bone element is considered, the low prevalence of osteoarthritic changes becomes even clearer. In most cases only one or two adult bones within the sample display evidence of osteoarthritic changes to a particular articular surface. It must be kept in mind that there are only 20 individuals that are over the age of 12 years at death recovered from Lemba-*Lakkous*. The small adult sample size, coupled with the low levels of preservation of articular surfaces, in some cases artificially raise the percentage of those affected with degenerative changes. None of the lower limb long bones displays any evidence of osteoarthritic changes, though several proximal foot phalanges do. This may represent localised degenerative changes to the foot with no wear and tear on the knee, ankle or hip or perhaps reflect the poor preservation of the epiphyses of the long bones. Osteoarthritic changes to the upper limb long bones are focussed on the elbow joint. The elbow could be used in a number of different daily activities for both sexes at Lemba-*Lakkous*, from throwing a spear or using a quern stone and rubber to felling a tree, pulling plants, making pots or carrying children. Any of these activities done repetitively or with particular stress could possibly lead to osteoarthritic changes. The general low levels of osteoarthritic changes amongst the Lemba-*Lakkous* skeletal sample can indicate: (1) that the activities in which the population engaged were not strenuous enough to cause osteoarthritic changes; or (2) perhaps that there is a general homogeneity of a lack of susceptibility to the degenerative processes; or (3) possibly that this skeletal sample of the overall population represents a particular group within the community who did not engage in physical labour to any great extent.

4.7.2.3 Trauma

Evidence of trauma at Lemba-*Lakkous* is rather limited and mild in its expression. A single distal hand phalanx displays evidence of a possible healed fracture and a single tibia has a patch of woven bone on the medial anterior aspect indicating a possible periosteal hematoma due to blunt trauma. The lack of evidence for trauma at Lemba-*Lakkous* seems to reflect a population where inter-personal violence was not prevalent. Both individuals affected are adults, one male and one female, and both seem to reflect accidental injury. It is possible that burial practice, taphonomy and preservation of the bones have impacted the results of the observation of trauma.

4.7.2.4 Disease and Disorder

Non-specific markers of disease and disorder are more prevalent amongst the Lemba-*Lakkous* skeletal sample than at Souskiou-*Laona*. Overall 11.3% of the discrete skeleton sample display at least one bone with possible evidence of a disease or disorder. This prevalence of individuals displaying non-specific indicators of disease or disorder is quite a bit higher than the results from the Neolithic (4.39%) population on the mainland (Eshed *et al.* 2010: 126). Evidence of disease such as cribra orbitalia was observed on 30.0% of the female adults and 8.8% of the subadult skeletons. In regards to the subadults, 8.8% is a significantly lower prevalence than other prehistoric populations from the eastern Mediterranean (see Eshed *et al.* 2010: 129 where Neolithic subadults prevalence is 40.0% and Chalcolithic subadults prevalence is 55.0%)[106]. None of the males observed display evidence of disease or disorder. The fact that only adult females are affected may indicate a difference in diet, lifestyle, susceptibility or burial location for those with a disease between the sexes.

The bones which display evidence of disease are the frontal, parietal, sphenoid and tibia. There are a variety of possible causes for these particular lesions on the skeleton (see Chapter Two) and the archaeological evidence from Lemba-*Lakkous* does not clarify the possible causes. Since the prevalence of indicators of disease or disorder amongst subadults is quite low at Lemba-*Lakkous*, but prevalence amongst adults is somewhat higher than other studies seem to reflect (i.e. Eshed *et al.* 2010: 129), it may indicate that in general, occurrence of disease within the population is quite low and/or those affected survive the assault into skeletal maturity and/or those stricken with the disease die before lesions form on the bones. Previous studies indicate that agricultural intensification will sometimes lead to higher prevalence of infectious, metabolic or hematopoietic diseases (i.e. Goodman *et al.* 1984; Larsen *et al.* 2007; Pechenkina *et al.* 2007). At both Lemba-*Lakkous* and Kissonerga-*Mosphilia*, the archaeological evidence seems to indicate that there was a gradual increase in the dependence on pastoral and agricultural resources, which may have resulted in the higher prevalence of non-specific indicators of disease (Colledge 1985; Croft 1985, 1991, 1998; Murray 1998).

4.7.2.5 Congenital Defects

With the exception of congenitally absent teeth, there were no congenital defects recorded amongst the skeletal sample from Lemba-*Lakkous*. This does not preclude the existence of congenital anomalies among the individuals from this site. However, the state of preservation makes it difficult to observe morphological defects. The only observed cases of infection represent a possible chronic sinus infection which has

[106] Again please see above for justification for using these populations for comparison with the Chalcolithic Cypriot populations.

resulted in woven bone within the sinus cavity and an apical abscess within a mandible. As noted above there are a number of different causes for an apical abscess (see Chapter Two). It must be remembered that most infections do not often reach the bones, killing the sufferer before the bone is involved (Ortner 2003: 180).

4.7.2.6 Conclusions

The general health status of the entire population from Lemba-*Lakkous* is certainly affected by the demographic profile of the population as the high proportion of subadults lowers the prevalence of degenerative lesions. The large number of subadults, who do not display much dental disease or osteoarthritic changes, presents a slightly different health profile from Souskiou-*Laona*. There is a higher prevalence of evidence of disease and disorder amongst the skeletal population. When the adult skeletal population from Lemba-*Lakkous* is considered, there are generally low prevalence of pathological lesions observed, particularly osteoarthritic changes. Trauma is not very common and congenital defects were not observed. The occurrence of the various dental pathologies tends to conform to the expected rates within prehistoric populations, with the exception of calculus. The expression of calculus is lower than is expected, possibly due to preservation issues. The skeletal sample from Lemba-*Lakkous* presented a challenge to palaeopathology assessment as preservation was typically quite poor. This high number of subadult and female adult skeletons within the mortuary population recovered from Lemba-*Lakkous* may indicate differences in burial practices at the settlement compared to the cemetery, particularly for adult males.

4.7.3 Kissonerga-Mosphilia

The general demographic profile of the individuals buried within the Kissonerga-*Mosphilia* settlement site reflects a predominately subadult mortuary population with 58.3% of the skeletal sample with an estimated age under 12 years at death. Therefore, the adult skeletal population is quite small (n=24) and this will affect the type and nature of the pathologies recorded on a population basis. The high percentage of subadults must be kept in mind when analysing the overall percentages of pathological occurrence within the population, as with Lemba-*Lakkous,* it will create artificially low frequencies of many age-related pathologies. The preservation of the skeletal material is not as poor as Lemba-*Lakkous*, with more articular surfaces intact. However recovery of the small bones of the hands and feet is still generally quite poor and again may reflect not only excavation methodology but also perhaps burial practices, which involved the posthumous movement of remains around the site. Female or probable female skeletons represent 54.2% of the adult mortuary population with a small sample of young adult male skeletons. There were no pathologies observed on the os coxae, sacra, clavicles, proximal hand phalanges, intermediate hand phalanges, distal hand phalanges, tibiae and fibulae. The general health status of the skeletal population from Kissonerga-*Mosphilia* as indicated by the prevalence of pathologies is quite good, with low frequencies of lesions.

4.7.3.1 Dental Pathology

The skeletal sample derived from Kissonerga-*Mosphilia* displays evidence of various dental pathologies, in particular calculus, LEH, ante-mortem tooth loss and periodontal disease with alveolar resorption. There is also minimal expression of dental caries and apical abscesses. Heavy attrition is recorded for 10.8% of the discrete skeleton sample. Calculus in particular is quite high when compared to the other two Chalcolithic sites, with 29.2% of the discrete individuals displaying accumulation to at least one tooth. This is mirrored in the expression of the pathology when analysed on a tooth-by-tooth basis. This prevalence may reflect oral hygiene, diet or possibly better preservation of the calculus. The adult males from Kissonerga-*Mosphilia* display a higher prevalence of calculus than the females. Females from Kissonerga-*Mosphilia* exhibit higher prevalence of dental caries, ante-mortem tooth loss and attrition, while males exhibit higher prevalence of calculus and LEH. Age at death may factor into the expression of ante-mortem tooth loss and heavy attrition at Kissonerga-*Mosphilia*. Only females display ante-mortem tooth loss and attrition, while the adult males recovered are all young adults and perhaps have not had the chance to wear down or lose their teeth. The comparatively high frequency of LEH amongst the Kissonerga-*Mosphilia* population in correlation with the large number of subadult burials within the sample may indicate that physiological stress during childhood had an impact on the population from Kissonerga-*Mosphilia*. The low prevalence of carious lesions overall possibly reflect a slightly less cariogenic diet. However, like Souskiou-*Laona* and Lemba-*Lakkous*, females display a higher prevalence than the males and while there are fewer lesions observed, they tend to be more severe.

Ante-mortem tooth loss was observed on only two discrete individuals, making it the lowest prevalence amongst the three sites. However, with one individual missing eight teeth prior to death, it reflects the most severe case. Ante-mortem tooth loss was only observed in females, which differs from Lemba-*Lakkous* where males have higher frequency of tooth loss. The ante-mortem tooth loss amongst the Kissonerga-*Mosphilia* sample seems to be in association with other dental pathologies. A maxilla displays apical cavities along with tooth loss, while two mandibles display apical cavities with *in vivo* tooth loss. Apical abscesses and alveolar recession are both more frequently observed at Kissonerga-*Mosphilia* than at Lemba-*Lakkous* or Souskiou-*Laona*. Overall, while there are fewer cases of most dental pathologies amongst the Kissonerga-*Mosphilia* population, the expression of the pathologies tends to be more severe. The worst case of dental disease observed from all three sites affects a female from Grave 571 at Kissonerga-*Mosphilia* where multiple dental abscesses has led to general osteomyelitis in the mandible and heavy attrition has lead to extensive tooth loss. There is, however, no indication of carious lesions on the teeth from Grave 571, which would seem to concur with the general low levels of that particular pathology within the Kissonerga-*Mosphilia* population.

4.7.3.2 Osteoarthritic Changes

The large subadult population at Kissonerga-*Mosphilia* has most likely affected the expression of osteoarthritic changes within the skeletal sample. There are generally low levels of osteoarthritic changes when analysed by joint amongst the discrete skeleton sample. There is a division in the joints affected based on sex, with males only displaying degenerative changes to the ribs and shoulders while females only display changes to the articular surfaces of the vertebrae, ankles, hands and wrists. Both sexes exhibit osteoarthritic changes to the bones of the feet, with females displaying a higher prevalence. Therefore, females display a greater variety in the joints affected with degenerative changes. This may represent a more diversified group of activities participated in by females, in comparison to males where limited expression on a select few joints may indicate a more focussed set of activities for that sex, possibly including heavy lifting.

The bones which display osteoarthritic changes are the vertebrae, scapula, ulna, trapezoid, metacarpals, distal first hand phalanx, ribs, navicular, metatarsals, proximal first foot phalanx, proximal foot phalanges, intermediate foot phalanges and distal foot phalanges. With regard to each bone element, there are very few cases affected with osteoarthritic changes. The changes observed are generally fairly mild and the impact on the lifestyle and mobility of the individual would most likely not have been very severe. With a variable age range for the adults observed, the low levels of osteoarthritic changes amongst the population may either reflect low levels of repetitive stress on the joints, a low susceptibility to this particular pathological expression or may reflect a particular group within the population which has been recovered from the excavations, while the majority of the population received a very different burial treatment.

4.7.3.3 Trauma

There is only one possible minor case of trauma amongst the discrete skeletons from Kissonerga-*Mosphilia*. This is expressed as ankylosed intermediate and distal foot phalanges from an adult individual. This pathology could also possibly represent a congenital trait, particularly if the bones belong to the fifth ray. There are a couple of other abnormalities on bones which may reflect trauma, a subadult humerus displays a patch of bone growth which likely represent a minor blunt trauma, a proximal foot phalanx and two intermediate foot phalanges display thickening of the diaphysis which may reflect a change in morphology due to trauma. Overall, the absence of evidence of trauma amongst the Kissonerga-*Mosphilia* skeletal population does not necessarily reflect the absence of traumatic incidents amongst the population. There is no evidence of interpersonal violence within the community and severe accidents have not been preserved or recovered within the skeletal sample from this site.

4.7.3.4 Disease or Disorder

Non-specific indicators of disease, disorder of deficiency were observed on 8.5% of all the discrete skeletons from Kissonerga-*Mosphilia*. All of these individual's are under the age of 21 years at death, with no adults displaying evidence of disease or disorder. Cribra orbitalia, porotic hyperstosis, general porosity of the long bones or bowing of long bones was observed on 15.0% of all infants, 10.5% of all children and 20.0% of all adolescents derived from Kissonerga-*Mosphilia*. The bones which are affected are the frontal, parietal, radius and femora. The relatively higher prevalence of LEH in adult teeth in conjunction with the higher prevalence of markers of disease or disorder amongst subadult skeletons may indicate that infectious, metabolic or hematopoietic diseases were more prevalent amongst subadults at Kissonerga-*Mosphilia*. Some of the individuals survived the initial assault and entered adulthood while a number of subadults within this mortuary population did not survive. The percentage of individuals with indications of disease from Kissonerga-*Mosphilia* is slightly higher than the results of analyses of all individuals from the Natufian (1.0%) and Neolithic (4.39%) populations from the Levant (Eshed *et al.* 2010:126).

4.7.3.5 Conclusions

There is no evidence of congenital defects amongst the skeletons from Kissonerga-*Mosphilia*, with the exception of possibly congenitally absent third molars. The general health status of the population from Kissonerga-*Mosphilia* is certainly affected by the demographic profile of the population. The large number of subadults, who do not display much dental disease or osteoarthritic changes, presents a slightly different health profile from Souskiou-*Laona* and more similar to Lemba-*Lakkous*. There is a higher prevalence of evidence of disease and disorder amongst the general population. Subadult individuals seem to display these pathologies more commonly which may be taken in conjunction with higher levels of LEH on permanent teeth of the adults in indicate a higher prevalence of disease within the Kissonerga-*Mosphilia* population. When just the adult skeletal population is considered, there is generally low prevalence of pathological lesions observed, particularly osteoarthritic changes. Trauma is almost absent and congenital defects were not observed. The occurrence of the various dental pathologies tends to conform to the expected rates within prehistoric populations, with the exception of carious lesions. There are fewer dental caries amongst this population which may reflect either a lower susceptibility within this population to this defect or simply a diet with less cariogenic foods. This high number of subadult and female adult skeletons within the mortuary population recovered from Kissonerga-*Mosphilia* may indicate differences in burial practice for different groups within the community.

4.7.4 Comparison

At the heart of the differences amongst the three sites is the different demographic profile at the cemetery compared to the two settlement sites. The majority of the skeletons examined at Souskiou-*Laona* are aged between 21-35 years at death, while the majority of the skeletons from both Lemba-*Lakkous* and Kissonerga-*Mosphilia* are under the age of 12 years at death. However, Kissonerga-*Mosphilia* does have a slightly more proportional distribution of young adults. There is no exclusivity in the burial practices observed based on age or sex, with a range of ages found at all three sites, but the proportions are quite different across the three sites. The disparity in the sizes of the different age groups skews the comparisons of pathological prevalence amongst the sites slightly, as Souskiou-*Laona* can provide a much larger 'adult' sample with a very small 'subadult' sample, while the opposite is true for the settlement sites. This is dealt with by making comparisons solely as a proportion of each discrete skeletal sample and by using Chi Squared and OneWay ANOVA tests to assess whether the prevalence indicates a statistically significant difference in pathological expression. It must be remembered that while the Souskiou-*Laona* cemetery is completely excavated, it is highly likely that much of the mortuary population at the settlement sites have not been located and excavated. Interestingly, the proportions of females, males and adults for whom sex cannot be determined are similar across all three sites, with females outnumbering males at all three sites. As well, the proportion of discrete individuals who do not display any evidence of pathology, around 60.0% of the population, is similar for all three sites. In general, the adult skeletal populations from the settlement sites are quite small, therefore statements about the health status of the adult population must be approached with some caution. A larger sample size would be better for making generalized statements about the health status of the population. In spite of the differences in demographic profiles, there are still patterns in pathological expression which can be determined within and amongst the three sites.

4.7.4.1 Dental Pathology

Based on the results within this study, while overall, the types of dental pathologies was quite similar, the nature of the pathologies is quite different across the sites. It seems that Souskiou-*Laona* and Lemba-*Lakkous* have a more comparable prevalence of dental caries and calculus than Kissonerga-*Mosphilia*. This may reflect more closely related diets, methods of preparing foods or quantities of food products consumed between Lemba-*Lakkous* and Souskiou-*Laona* than with Kissonerga-*Mosphilia*. The skeletal population from Kissonerga-*Mosphilia* displays a far lower percentage of teeth affected with caries and a higher percentage of teeth with calculus than the other two sites. The age distribution of dental pathologies indicates that the older individuals were affected more severely than the younger individuals in most cases. Very few deciduous teeth from all three sites display any evidence of pathology and in the case of the heavy attrition represent retained deciduous molars. There seems to be something of a pattern of pathological expression based on sex amongst the three sites, with females typically displaying a higher prevalence of dental caries, as is evidenced in other pathological studies. Males tend to have a higher prevalence of calculus and at Lemba-*Lakkous* and Souskiou-*Laona*, a higher prevalence of ante-mortem tooth loss. The differences in expression of dental pathologies within and amongst the sites seem to suggest the possibility that different diets were consumed by males and females, with more cariogenic foods within the female diet or differences relating to food preparation for each sex. If this is the case, the different diets possibly indicate different activities, roles and positions within the community based on sex which is consistent with previous studies of agricultural prehistoric populations. (i.e. Eshed *et al.* 2010; Larsen 1995, 2000; Molleson 1994).

4.7.4.2 Osteoarthritic Changes

Osteoarthritic changes observed on the skeletal samples from all three sites present an interesting pattern of possible divisions of labour between the sexes. There are some similarities across all three sites with only adolescents and adults of various ages displaying degenerative changes. Females at all three sites display a wider selection of joints affected with osteoarthritic changes, while males are more limited in the joints affected by degenerative changes. Amongst the sites, the skeletons derived from Souskiou-*Laona* tend to have a higher prevalence of degenerative changes to more than one joint and the severity of the pathological change is often more severe. There are also specific joints which are affected primarily by one sex or the other. This most likely reflects a division of labour between the sexes which is somewhat consistent across all three sites, with females participating in a wider range of activities. Osteoarthritic changes to the bones of the feet in particular provide a good example of the division with a far higher percentage of females displaying degenerative changes to these bones than males, particularly at Souskiou-*Laona* where the steep and rough local terrain likely affected the prevalence of foot stress. The shoulder joint also provides a good example of the differences between the sexes, as only males display osteoarthritic changes to the joint. In general, the low prevalence and typically mild nature of the expression of the degenerative changes indicates that the individuals from these three samples did not seem to suffer from severe changes to the joints which would have impaired their function.

4.7.4.3 Trauma

Evidence of trauma is quite limited across all three sites, most likely indicating that while certainly minor accidental trauma was suffered, it does not seem to be particularly common. Perimortem trauma could not really be assessed given the poor state of preservation. However, there is no evidence within the samples examined to believe that interpersonal violence was present. It must be remembered that burial practices may vary depending on the cause of death (i.e. violent deaths may not be buried within the cemetery or settlement). Evidence of disease and disorder was prevalent at higher rates at the settlement sites than at the cemetery site. Subadult individuals display the majority of the indicators of a possible disease, which possibly indicates that the disease played a key role in the mortality rates of infants and children at the settlement sites. Skeletal markers of a possible disease are rather limited amongst the adults at all three sites. This possibly implies that those that suffered from disease in childhood did not survive to adulthood or if disease was contracted in adulthood, the individual did not survive long enough for skeletal lesions to form.

4.7.5 Preservation

While burial practice and preservation had an impact on the assessment of pathologies within the tombs at Souskiou-*Laona*, recovery and preservation seems to play an equally significant role in the issues of analysis at Lemba-*Lakkous* and Kissonerga-*Mosphilia*. The post-mortem movement of human remains around the settlement sites burials have had an impact on skeletal completeness. Preservation of the skeleton in regards to general completeness affected the ability to assess and diagnose pathologies. This is perhaps best demonstrated by the carpals, which had a very poor recovery rate from the settlement sites. Considering that each complete skeleton should have 16 carpals and there are a minimum of 263 individuals across the three sites, the recovery of carpals is not very good. There are a total of 374 carpals recovered, representing 8.9% of the expected number of carpals based on the MNI. There are a number of possible reasons for this: firstly, the recovery of the carpals at the settlement sites is quite poor, impacted not only by excavation recovery, but also burial programme as the skeletons seem to have been moved between burials post-mortem. Second, the general morphology of the carpals, particularly subadult carpals, may not survive the highly destructive taphonomic forces at work on Cyprus. Finally, as there is so much post-mortem manipulation of the skeletons at all three sites, there could be selective retention of various bones with the living[107]. Given that so few small bones were recovered from the settlement sites, comparison of prevalence was rarely statistically significant despite the much higher percentage results from the settlements from much smaller samples. Therefore, it was important to assess and compare each bone to other like bones in order to determine if there are any patterns in disease expression. The low frequency of disease expression amongst all three populations is clear when examined on a bone-by-bone basis.

4.7.6 Conclusions

Comparisons with other contemporary adjacent cultures to those on Cyprus during the Chalcolithic period does not seem to be possible at this time as there have not been many palaeopathological analyses done for this period in the ancient Near East (i.e. Agelarakis *et al.* 1998; Dawson *et al.* 2003; Özbek 2001; Lev-Tov Chattah and Smith 2006). Palaeopathological studies in the Levant are predominately focussed on the Natufian-Neolithic transition in an effort to understand the changes to health during the transition from a hunter-gatherer lifestyle to a more sedentary agricultural lifestyle (i.e. Eshed *et al.* 2004a,b, 2006, 2010; Hershkovitz *et al.* 1991, 2009; Molleson 1994). In general, skeletal populations from the Chalcolithic period on Cyprus which were examined for this study reflect low prevalences of dental disease, osteoarthritic changes, disease and disorders, trauma and congenital anomalies. In many cases the percentages generated from this analysis are situated somewhere between those calculated for the Natufian and the Neolithic periods in the Near East which may reflect the mixed subsistence economy of the Chalcolithic Cypriot peoples.

4.7.7 A note on the palaeopathological results by burial context

When examining the tombs in regards to pathological expression, there are a greater percentage of the burial contexts from Souskiou-*Laona* containing at least one

[107] Further work is currently underway regarding the taphonomic processes affecting the skeletal remains in Cyprus and on the burial programmes which were in effect at each site.

individual with at least one pathology. This is due to the burial programmes in place at each site. As there are generally more individuals (average of 4.6 individuals per burial context) within a smaller number of tombs at Souskiou-*Laona*, it increases the probability that there will be at least one individual with a pathological lesion, whereas the graves at the settlement sites tend to hold fewer individuals and therefore there is less chance of an individual with pathology within a grave. The nature of the results based on burial context, due to the assumption that complete skeletons would be present, makes the assessment valuable in regards to comparison between the sites, but the actual numbers are rather theoretical. The general results across all three foci of analysis (individual, skeletal element and mortuary feature) are usually harmonious, meaning that the site which displays the highest prevalence of a particular pathology by individual, will also tend to display the highest prevalence by bone element and mortuary feature, providing support for the results generated.

4.8 Burial Location and Social Structure as interpreted by Pathological Expression

As discussed above, the three skeletal samples examined for this research are relatively contemporaneous and are derived from the context of a homogenous culture based on architecture, artefact types and ceramics. The biological relatedness of these populations is currently unknown, but hopefully will be illuminated by future studies (i.e. Parras' [2004, 2006] work on non-metric dental traits, 2004, 2006). Therefore, each skeletal sample must be taken as discrete within this comparison. There are clear differences in burial practice between the settlement and cemetery sites from the Chalcolithic period which is not consistent with the other elements of Chalcolithic life. As Peltenburg states: 'the dearth of unambiguous archaeological indicators for internal contacts suggests the existence of autonomous communities, but that leaves unanswered the question of the means of social integration that formed relatively homogeneous cultures throughout the island' (1991: 107). Kissonerga-*Mosphilia* provides an indication of the different grave types used during this period indicating that there are a variety of burial practices in the Middle Chalcolithic (Niklasson 1991; Lunt *et al.* 1998). Whether the differences in burial practice between the settlement and cemetery sites reflects a difference in beliefs, cosmology or burial rites is somewhat inconclusive at this point, as it is suggested that discrete burial areas for Lemba-*Lakkous* and Kissonerga-*Mosphilia* are possible (Lunt *et al*. 1998: 85;

Peltenburg 1991: 115). It may simply be that the external cemetery for Lemba-*Lakkous* and Kissonerga-*Mosphilia* has not been found and due to the terrain of the Souskiou-*Laona* settlement site (OpA), it may not have been possible to bury people within the settlement site. However, work continues at this site by Peltenburg and the University of Edinburgh and it is as yet unpublished. Therefore, at this point, the different burial programmes at the three sites represent local tradition or practice and cannot be examined on a regional level, amongst the overall population of Southwest Cyprus, as representing different stratified mortuary features.

'The place of the dead in any society will have significant and powerful connotations within the people's perceived social geographies' (Parker Pearson 1999: 141). There are often cultural, logistical and/or economic factors which dictate why a particular individual is buried in a particular location[108]. There does not appear to be a correlation between pathological lesions and burial location within the three sites, based on this study. Therefore, pathology or disease cannot be seen as a determining factor of burial location based on the mortuary populations examined. This statement must be qualified by the point that it is most likely that each skeletal collection examined within this study only represents a portion of the general population of the site, particularly in regards to the settlement sites where the entire site is not excavated and the period of occupation would have resulted in a larger mortuary population. Therefore the sample examined may represent a homogenous group within the overall living population from the site. However, as it is not possible to determine otherwise without the complete population, the skeletal collections examined are taken as representative of each particular population for the purposes of this research.

Can the expression of pathological lesions on the skeletal remains provide evidence of any aspect of social structure at the Chalcolithic sites? Peltenburg asserts that the development of the 'high sector' within the village of Kissonerga-*Mosphilia* at the pinnacle of the Middle Chalcolithic period (3b ~ c.3000 BC) represents the formation

[108] Cultural factors which could possibly influence burial location could include taboos based on age or sex or social status, nature of death, time of death, etc… which stem from sociocultural beliefs about life and death in the period (Parker Pearson 1999: Chapter Six deals with placement of the dead). Logistical factors which could influence burial location of an individual would likely involve issues of geography, geology and climate. Economic factors which could possibly influence burial location, include maintaining territorial holdings, resources, or kinship or familial rights to a particular industry (Parker Pearson 1999: 136-137).

of an intra-village stratification with evidence of different building quality, ritual and feasting (2002: 57-59). He argues that this involved a major ideological shift and the restructuring of the gender roles within society based on the economy of the population which had began to place greater emphasis on agriculture, which is the females' domain (based on the traditional association of females with the home and males hunting), forcing males to redefine their strategic role (hence the destruction of the female figurines in the ceremonial area at this time) (Peltenburg 2002: 59). While the palaeopathological results in this study support differences in diet and activities between males and females, it does not place males in a socially superior position. That females have a higher prevalence of caries, as discussed above, can be a result of several factors, including a higher consumption of grains which is linked to agricultural production. The group associated with the 'high sector' is unclear: Peltenburg suggests that males were buried within the high sector, yet no remains were recovered from the graves excavated there (Peltenburg 2002:61, 62). As Chapman (2003: 79) argues, 'in stratified societies inequalities are institutionalized: they occur 'as a result of rules that act effectively to bar part of the population from social, economic, or political resources' (Jones 1981: 151)'. The inclusion of picrolite in select graves has encouraged its interpretation as a prestige product, available to only certain individuals within the population (Peltenburg 1991: 114). However, interpretations in regards to picrolite and its inclusion in certain graves vary based on the focus of the analysis and perhaps further work on the origins of the raw material and the manipulation of material which is currently underway will shed more light on the place of picrolite within the Chalcolithic populations (i.e. Bolger 2002; Peltenburg 1991a, 2002; Windsor 2009).

Therefore, while the archaeological evidence seems to indicate a stratified society according to the above interpretations, there are no patterns in the palaeopathological analysis that unambiguously indicate social stratification. The differences in pathological lesions observed based on sex, does not in itself reflect an inequality between the sexes. The differences possibly indicate that there was a division of labour and possibly diet between the sexes. The two sexes most likely participated in different activities, particularly relating to the economy. Therefore, based on the mortuary samples present, the pathological evidence does not seem to offer indications of a socially stratified population. In order for social structure, social stratigraphy or hierarchy to be evidenced through pathologies several criteria need to be fulfilled: (1) groups within the population need to have significantly different lifestyles in regards to nutrition, health, activity, stress or risk; (2) the different levels of society need to be able to be identified through archaeological evidence such as grave goods or other mortuary practices; and (3) the health and physical well-being of a living population can indeed be interpreted through the skeletal remains, in regards to the osteological paradox (Robb *et al*. 2001: 213-214). While the archaeological evidence seemingly indicates a stratified social order, there is no clear indication of which of the groups within the population attained a higher status, barring the inclusion of picrolite in a grave, which is most commonly associated with children's graves (Bolger 2002: 78; Peltenburg 1991: 114). Therefore, it is difficult to compare and discuss the social status of a particular individual and correlate this to their health status according the observation of pathologies. Previous studies attempting to discuss social status and health status in prehistory have had varying results, indicating that there is no clear and definitive set of criteria correlating social status with health status (Robb *et al*. 2001 and references within). In general then, the pathological analysis provided here, for the Chalcolithic populations, cannot be used to support the previous interpretations of a stratified society, but does suggest that there was a division in labour and possibly diet based on sex. A greater depth of interpretation of social structure and differences amongst mortuary features will be possible when the archaeological evidence, such as grave goods, is correlated with this pathological analysis.

4.9 Conclusions

This chapter has discussed the results of the palaeopathological analysis, placing them within the context of the Chalcolithic period on Cyprus. In doing this several points have emerged. Firstly, there is a male-female division in particular pathologies which seem to indicate a division of labour and possibly diet based on sex. Females display a higher prevalence of carious lesions and males present a higher prevalence of calculus. Osteoarthritic changes affect females on a greater variety of joints, with a higher prevalence in particular on the feet, wrists and hands, and males exhibit degenerative changes on fewer joints, though prevalence is higher on the shoulders and elbows. There is no evidence that any of the patterns in pathology amongst the groups are consistent with a stratified society and as discussed above, further interpretations regarding social stratigraphy need to include further strands of archaeological research. As well, pathological expression does not seem to have any bearing on burial location at this point, with no apparent pattern to the appearance of pathology and burial location within each site. Secondly, as the three skeletal samples must be taken as discrete, the different types of burials cannot be taken to reflect differences in a regional social stratigraphy at this point as each discrete group may have simply followed a different burial programme. Therefore, there are most likely, other, currently unknown reasons (such as cosmology, ritual or belief dictates) for the burial location of the individual within the Chalcolithic populations. Thirdly, that in general, the pathologies observed seem to reflect rather mild expressions of disease or trauma and while pain is not definable within the populations, it seems likely that most pathologies observed would not have caused any functional impairment of a particular body part. And finally, the results of this study reflect the detail of the information which can be derived from poorly preserved, commingled human remains when good excavation and careful recording both in the field and in the laboratory are utilised. The following chapter will present the final conclusions and future avenues of study.

Chapter 5: Conclusions

While there is a long tradition of physical anthropological studies on Cyprus (see Chapter One), new methods and technologies in bioarchaeological analysis are continually improving. This has allowed information to be gained from poorly preserved human remains which previously may not have received the attention they deserve. Due to preservation issues of skeletal tissue on Cyprus, studies of archaeological human remains have been slow to gain recognition as important to the overall archaeological record in terms of understanding past populations. The human remains recovered from the Souskiou-*Laona* cemetery (Operation C) present the opportunity to study a well excavated, recorded and contextualised sample with comparisons to contemporary sites, allowing for a problem-oriented study. The research presented within this thesis had two main questions: (1) Can the poorly preserved human remains from the Chalcolithic period in Cyprus be used in a palaeopathological analysis? And (2) are there patterns in the type or prevalence of pathological lesions based on sex, age or discrete mortuary feature within the Chalcolithic skeletal series? By using three contemporaneous sites to compare the types and prevalence of pathological lesions, the hypotheses, firstly, that pathologies can be observed on the poorly preserved skeletal material; and secondly, that patterns of pathological expression, if present, can possibly be interpreted to add depth to the understanding of the lifeways and social relationships of the Chalcolithic peoples, were proved valid.

A sample of the skeletal remains from Souskiou-*Laona* cemetery was compared to the skeletal remains derived from the settlement sites of Lemba-*Lakkous* and Kissonerga-*Mosphilia* based on the examination, analyses and interpretation of pathological lesions. The research presented within this thesis is the first comparative palaeopathological study of Chalcolithic populations involving several sites in Cyprus. Therefore, it fills a lacuna in the current studies of health and disease on the island. The results of the palaeopathological analysis for the Chalcolithic period are another strand of information which, when combined with the other studies of the archaeological material, affords a clearer and more detailed image of the experiences, lifeways and social relations of the populations from this period. Many factors influence the general health status or disease processes of a population. Therefore, the wealth of archaeological evidence available for the Chalcolithic period in Cyprus allows for a contextual interpretation of the pathologies observed. In regards to the representativeness of the skeletal collections examined for the Chalcolithic period, the skeletal remains from Souskiou-*Laona* represent the largest skeletal population from the Chalcolithic period in Cyprus and the settlement sites of Lemba-*Lakkous* and Kissonerga-*Mosphilia* provide the third and second largest skeletal samples, respectively. Utilising the largest sample sizes available ensures that this research is as comprehensive and inclusive as possible for the Chalcolithic period on Cyprus. However given that all three sites are located in the southwest region of Cyprus, regional bias must be considered in regards to environmental and cultural differences across other areas of the island. Therefore, while the regional proximity of the three sites makes them comparable within this study, their general representativeness for the entire island may be limited, despite the general homogeneity of culture across the Chalcolithic period (Peltenburg 1991: 107). There is some consistency of human remains across Cyprus; the preservation of human skeletal remains is fairly consistently quite poor as evidenced by the three skeletal collections studied within this thesis.

5.1 Preservation

It was postulated for this research that important biological information could be acquired from the poorly preserved human skeletal remains from Chalcolithic Cyprus. The results of the palaeopathological analysis support this hypothesis with evidence of different pathology types observed and several interpretations of the patterns of pathological prevalence. There are several limitations to the study of health and disease observed through this study, including: variations in burial practices which entail the movement and removing of skeletal elements, issues with recovery and excavation methods which affects the skeletal elements available for examination (i.e. the carpals), curation and reconstruction attempts which can obscure the surface of the skeletal element and taphonomic processes which have had a detrimental effect on surface condition and fragmentation levels of the skeletal elements. Despite these limiting factors, this study has demonstrated that information regarding the population’s health status can be derived. In order to deal with issues of recovery due to burial practice or excavation methods, pathological lesions were recorded and analysed based on discrete skeletal elements which provided a more precise prevalence of pathology as like elements were compared. To deal with issues of curation, preservation and fragmentation, qualitative descriptive levels were created and scaled to provide a better understanding of general skeletal survival. As well, pathological prevalence was recorded and described based on the specific part of the skeletal element and compared with like parts for a more precise reflection of pathology prevalence. Over-confidence and over-estimation of particular pathologies, which can be associated with poor preservation, was avoided within this study by maintaining general categories of pathology types and applying the standard differential diagnoses approach.

As the skeletal material from Souskiou-*Laona* has demonstrated, appropriate care and methods applied to the excavation will result in a greater range of possibilities for post-excavation analysis and interpretation. In regards to preservation issues, understanding the processes of bone diagenesis will aid in understanding why the skeletal material appears as it does, although it will not change the impact on the various limitations due to poor preservation. Therefore, it is essential that methods to deal with these limitations continue to evolve and improve, as this study has done by adapting methods to incorporate scales of preservation for the surface condition and fragmentation levels of the skeletal material. Curation and care for the skeletal remains after excavation should follow a policy which includes guidelines regarding conservation of the skeletal material and encourages appropriate and conservative use of consolidants (such as that supported by the Museum of London – internet reference). This will limit the issues of assessment due to improperly conserved skeletal elements in future work. In spite of the limitations discussed within this paragraph, the adaptations to and application of standard anthropological methods permitted the examination and analyses of the pathological lesions on the skeletal material with valuable results for a greater depth of understanding of the Chalcolithic populations. The following section will provide the conclusions reached based on the analyses and interpretations of the results of the palaeopathological examination.

5.2 Conclusions based on the Results of the Palaeopathological Analyses

It was postulated that not only was it possible to gain valuable information from the poorly preserved human skeletal remains of the Chalcolithic period, but patterns of pathological type and prevalence would add to the overall understanding of the

Chalcolithic period. This hypothesis was supported by the interpretations of the results of the palaeopathological analyses, the conclusions of which are presented within this section. The analysis of health status across the three sites focussed on several categories of pathology (dental pathology, osteoarthritic changes, trauma and infection, congenital defects and evidence of metabolic, hematopoietic, infectious or parasitological disease or disorder) with the purpose of illuminating any differences amongst age groups, sex and discrete mortuary feature. As noted above, the pathological analyses were approached with three foci, by individual, skeletal element and discrete mortuary feature, in order to thoroughly explore the most precise results of pathological prevalence. The results of the analyses are presented in chapter three in great detail and discussed in chapter four with interpretations regarding lifeways and social structure in the Chalcolithic period. General conclusions regarding the health, lifeways and social structure of the populations represented by the skeletal samples studied, as derived from the analyses of the various pathology categories, are presented in the paragraphs below.

5.2.1 Dental Pathology

Dental pathologies (such as caries, calculus, LEH and ante-mortem tooth loss) are frequently used to discuss aspects of diet and general health status within archaeological populations (i.e. Buzon and Bombak 2010; Eshed *et al.* 2006; Goodman 1991, 1993; Hillson 1979, 2001; Molleson and Jones 1991; Powell 1985; Turner 1979). Heavy attrition of the teeth, while not explicitly a pathology, is also included within this section as it is frequently associated with other dental pathologies (see chapter two). There may be greater similarity in diet, food preparation method, oral hygiene or susceptibility to caries and calculus at Souskiou-*Laona* and Lemba-*Lakkous* than Kissonerga-*Mosphilia* based on the prevalence of these pathologies on the teeth from each site. The observations amongst all three sites reflect a difference between males and females in regards to the types and nature of dental pathologies, mainly caries and calculus. In general, dental pathologies were observed in low to moderate levels amongst all three populations. LEH and calculus in particular were observed with very low frequency on a tooth by tooth basis. The impact of preservation cannot be ignored here. Surface preservation of the teeth is quite poor in general and the observation of these particular defects would be affected to a higher degree than dental caries where the destruction of the tooth crown is not as affected by taphonomic processes. Thus, comparatively with the other dental pathologies, LEH and calculus present lower prevalence. When compared to other studies of prehistoric populations and explored in conjunction with the archaeobotanical and archaeofaunal studies (see chapter four) the expression of dental pathologies are consistent with a population exploiting a mixed economy of hunting, herding, gathering and agriculture. Therefore, the expression of dental pathologies in the skeletal samples examined within this study have provided an indication of differentiation in diet between the sexes and reflected the general subsistence economy exploited by three populations in Chalcolithic period.

5.2.2 Osteoarthritic Changes

Pathological analyses are often used in studies to discuss activities performed by prehistoric populations and the different groups within the population who would have performed these activities (i.e. Eshed *et al*. 2004a; Molleson 1994, 2007b; Powell 1988). Activity-related changes can present themselves in various ways in the skeleton, including through pathology such as osteoarthritic changes or degenerative joint disease, accentuation of entheses or muscle attachment markers, robusticity and cross-sectional geometry (i.e. Eshed *et al.* 2004a; Jurmain 1990; Kennedy 1989; Stirland 1991). However, the reconstruction of the activities of people in the past from these skeletal changes is complicated due to the fact that they can be interpreted in different ways and there are many external factors which cannot be accounted for within an archaeological sample (i.e. Larsen 1996, 2002; Jurmain 1990). Therefore, while there are definitely patterns and differences in osteoarthritic changes observed on the three Chalcolithic samples based on sex, there is very little chance to associate this with specific tasks during life. The general fragmentation of the skeletal material and burial practices of the Chalcolithic populations makes it even more difficult to assess the differences in the prevalences of osteoarthritic changes amongst individuals and between the sexes. For example, the highly fragmented vertebrae could not often be attributed to a particular individual within the tombs from Souskiou-*Laona* and often were in such poor condition the fragments could not even be associated to one another, making the minimum number of vertebrae impossible to assess. Poor joint surface preservation amongst all three samples made it difficult to observe the signs of osteoarthritis. Therefore, it may be that the level of occurrence is actually higher than presented. Thus, as discussed in Chapter Two, the surface preservation and fragmentation of the skeletal material will have implications to the general prevalence of osteoarthritic changes on each joint or body part within this study and is therefore compared only to percentages on like parts which are present.

Males and females across all three sites have different joints affected or different prevalence of osteoarthritic changes. This differentiation possibly indicates a division of labour based on sex, with males participating in activities which more frequently use the shoulder joint. Females display a greater variety of joints affected with osteoarthritic changes, indicating perhaps a wider range of activities in which females participated. While there are some similarities across all three sites regarding the differentiation between males and females, the adult individuals derived from Souskiou-*Laona* display osteoarthritic changes on a wider range of joints, particularly the females. As there is no statistically significant difference amongst the three sites regarding the observation of osteoarthritic changes on the joints, it is possible that similar lifeways and labour requirements were present at each site, despite the minor differences in joints affected. As would be expected, given the aetiology of osteoarthritic changes, older individuals display a higher prevalence of degenerative changes across all three sites, though the older adult sample is rather small at the settlement sites. This is perhaps consistent with the archaeological material evidence which has lead to the interpretation of a fairly homogenous culture across the southwest of Cyprus in the Chalcolithic period.

5.2.3 Trauma

Trauma can be assessed in palaeopathological studies to discuss aspects of activity and social relations (Larsen 1997: 109). There are very few occurrences of trauma observed in the three skeletal samples examined from Chalcolithic Cyprus. Most of the trauma observed occurs on bones from Souskiou-*Laona* and seems to reflect accidental injury rather than violence. There is no significant difference between the sexes in the prevalence of trauma. Therefore, the presence of trauma indicates that at least some individuals within the population were engaging in activities or lifeways with some risk of injury. The absence of evidence of interpersonal violence does not negate its presence in the general population; it is simply not present amongst the skeletal sample observed for this study. That the majority of the trauma, and the most severe trauma, is observed at Souskiou-*Laona* may be a reflection of the differences in terrain between the steep, hilly cemetery location and the more gently sloping settlement locations, assuming that the skeletal series derived from the cemetery lived in a similarly steep and hilly countryside.

5.2.4 Disease or Disorder

Evidence of metabolic, hematopoietic, infectious and parasitological diseases and disorders was observed in the form of cribra orbitalia, porotic hyperostosis, general porosity and bowing of the long bones amongst the skeletal samples from the three Chalcolithic sites. Evidence of disease and disorder are frequently used within palaeopathological studies to discuss the general health status of archaeological populations (i.e. Belcastro *et al.* 2007; Eshed *et al.* 2010; Larsen 1995; Robb *et al.* 2001). There is a higher prevalence of indications of disease and disorders on the bones from the settlement sites, in comparison to the Souskiou-*Laona* cemetery. Subadult individuals from Kissonerga-*Mosphilia* display the highest prevalence amongst the Chalcolithic skeletal samples. However, in general when compared to other prehistoric populations from the Eastern Mediterranean, the prevalence is still quite low (see chapter four for comparisons). Preservation likely plays a role in the low prevalence levels observed as the fragmentary nature of the skeletal material meant the frontal orbits often did not survive and morphological changes based on cortical thinning due to disease is more difficult to observe. As well, it must be kept in mind that pathological lesions due to disease only form in chronic cases, whereas if the disease is acute and kills the individual quickly, no evidence will remain on the skeleton. Therefore, the fact that any evidence of disease or disorder is observed indicates a population where some form of disease or disorder was present.

5.2.5 Congenital Defects

There were very few congenital defects observed within the Chalcolithic skeletal populations. Two of the transitional sacral vertebrae recorded within the Souskiou-*Laona* sample do occur within the same tomb context which may indicate a familial connection in the deposition of individuals within the tombs at Souskiou-*Laona*. This is an extremely tenuous connection and further studies are needed to establish the biological affinity of the skeletal population. Ancient DNA analyses are most likely not possible for the Souskiou-*Laona* sample given the poor preservation of the bones (i.e. Chilvers *et al.* 2008; Haynes *et al.* 2002; Rollo *et al.* 2002). However, other methods such as non-metric traits, which have been used on Cyprus before with some success (see Parras 2004, 2006) may be able to shed light on the biological affinity of not only those within the Souskiou-*Laona* tombs, but also for the entire Chalcolithic Cypriot population. There are many socio-cultural factors which must be considered when attempting to establish the reason for burying an individual in a particular place, using a particular method (Parker Pearson 1999: Chapter Six). Hopefully, with further metric analysis and possibly chemical analyses, more information can be gained as to 'who' was buried at Souskiou-*Laona*.

5.2.6 Burial Practices

The proportion of skeletal material from each of the three sites is quite consistent whether assessed based on individual or by each discrete skeletal element. The overall quantity of material coming from each site is roughly 60.0-70.0% from Souskiou-*Laona*, 10.0-20.0% from Lemba-*Lakkous* and 20.0-30.0% from Kissonerga-*Mosphilia*. Since each discrete skeletal element (i.e. humeri, hand phalanges, femora, etc…) was relatively proportional to the other discrete skeletal elements from that site, it would seem to indicate that intact individuals are being interred at each site. The skeletal material and burial programme at each site reflects some manipulation and movement of skeletal material by the living. Further research is in progress to discuss the burial programme at Souskiou-*Laona* and future work should attempt to compare and discuss the different practices at each Chalcolithic site. The careful planning and excavation at Souskiou-*Laona* will hopefully allow for a greater depth of understanding of the burial programme which will in turn present greater avenues of interpretation of cosmology and belief systems from the Chalcolithic period.

5.3 Implications of the Results in regards to Chalcolithic Cyprus

The research presented in this thesis discusses the general health status of three Chalcolithic Cypriot populations through an analysis of the prevalence and patterns of pathological changes of the skeletal material. Overall, analysis of the skeletal material examined for this study seems to reflect populations which suffered a variety of physiological stresses, trauma and diseases, though the prevalence of any given pathology type was not extensive in most cases. There are patterns of pathological lesions within the populations which indicate a division of labour and a different diet between the sexes. Males display higher rates of calculus and females have higher rates of dental caries. Post-cranially, males exhibit osteoarthritic changes to a more select group of joints, while females are more varied in the joints which are affected. There seems to be a certain amount of homogeneity in this observation across all three sites in regards to pathological expression which may mean that it is possible that all three populations were similar in their activity/labour divisions based on sex. The mixed subsistence economy employed by the Chalcolithic populations in the southwest of Cyprus is possibly associated with the division in labour based on sex (as other studies have found i.e. Eshed *et al.* 2004a, 2010). As well, this varied economy may have possibly buffered the populations from certain metabolic diseases resulting from a vitamin deficiency or malnutrition or starvation due to over-reliance on a single food product (Roberts and Manchester 2005: 221-224). Aspects such as the terrain and environment likely played a role in the occurrence of particular pathological lesions at particular sites, such as the foot trauma observed at Souskiou-*Laona.* Future studies further comparing the results from this research with results from other populations in the Eastern Mediterranean and Near East during this period will help to elucidate aetiologies for the observed pathologies as determining similarities and differences in experiences can aid in comparatively assessing the cause of a lesion. While there are subtle differences amongst the three Chalcolithic sites studied here in regards to type and frequency of pathology observed, they are not typically statistically significant and seem to indicate similar lifeways across this region of the island. The continuing excavations at the Souskiou-*Laona* settlement site will hopefully shed more light on the lives and lifestyles of the individuals derived from the Souskiou-*Laona* cemetery and provide further comparative interpretations.

Palaeopathological studies have previously been used to discuss aspects of social structure within an archaeological population (i.e. Buzon 2006; Pechenkina and Delgado 2006; Powell 1988; Robb *et al.* 2001 and references within). Interpretation of the archaeological record by Peltenburg (1991, 1993, 2002) and Bolger (1992, 1994, 1996, 2002, 2003) presents a socially stratified population in the later Middle Chalcolithic period in southwest Cyprus. The palaeopathological analysis was examined within this context and does not necessarily seem to be consistent with these interpretations. While there does seem to be a division of labour/activities and possibly of diet between the sexes, the results of the pathological analysis do not necessarily reflect a stratified society based on the skeletal samples examined. The social status of a group within a population is difficult to determine based on pathological prevalence as Robb *et al*. have presented (2001). If subadults are viewed as a discrete social group, the social status of subadults is particularly difficult to discuss within the Chalcolithic Cypriot populations (Halcrow and Tayles 2008 for discussion on the bioarchaeology of childhood). The archaeological evidence places prestige products (i.e. picrolite pendants) most often within subadult burials at the settlement sites (Peltenburg 1991: 114). Lunt describes high rates of infant mortality (1985: 246) and the current analysis of the skeletal remains indicates that a high proportion of the settlement's skeletal series are subadults. The palaeopathological analysis of the subadult remains, predominately derived from the two settlement sites, presents a portion of the subadult skeletal sample with evidence of disease or disorder and few other pathological lesions. Therefore, if subadults form a discrete social group within the overall population which are privileged in some manner to have a prestige item buried with them, it did not necessarily entail a better health status[109]. Overall, there is inconclusive evidence within the pathological analysis to determine the social status of children within the general mortuary populations examined. As noted above, while the prevalence and type of pathologies observed on the adult skeletons reflects a division of labour and diet based on sex, there is no evidence from pathologies on the skeletal sample examined for this study that there is a stratified component to the social structure. The complex association of social status and health status cannot be interpreted based on the pathological analysis alone. Further analysis including the association of grave goods, mortuary feature architecture and burial location with the demographic and palaeopathological results is required to discuss in depth possible social relationships and structure.

5.4 Implications of this Study for Palaeopathological Studies

In general, there are not a great number of comprehensive palaeopathological studies for prehistoric Cyprus, or indeed for the prehistoric periods in the Eastern Mediterranean region (with the exception of Eshed *et al.* 2004a, b, 2006, 2010;

[109] Another possible interpretation of the inclusion of the picrolite figurines and pendants within the graves of subadults could be that picrolite was associated with childhood and children as a commodity to the population, representing its future, but as the individual aged, picrolite was not a product that an adult was meant to have. Perhaps there was an age-related association with picrolite. Windsor has interpreted the picrolite within the burials as being associated with death ritual and the establishment of familial connections in death (2009: 70). Therefore, there are a number of interpretations regarding the picrolite figurines and their association with particular members of society.

Molleson 1994, 2007b). Therefore, this study fills the lacuna of comprehensive pathological studies for the Chalcolithic period on Cyprus and provides a source for comparison with other prehistoric populations within the region. Comparative palaeopathological studies are important for the development of a general worldwide histiography of the disease processes present at any given period, which will in turn aid in understanding the aetiologies of the various pathologies which affect human skeletal tissue.

In regards to methodological considerations in palaeopathology, this study presents adaptations to current standards of data collection, by including qualitative scales of description for preservation. Where other studies have included factors such as completeness of the skeleton or skeletal element within their research (i.e. Waldron 1987), the qualitative descriptions of surface condition and level of fragmentation were included within this study to permit a greater understanding of the limitations to the palaeopathological analysis and thus a more precise reflection of the prevalence of a particular pathology.

5.5 Implications for Bioarchaeological Studies

When pathological studies are examined within their archaeological context a deeper understanding of the population and hence of the possible causes of the pathological lesions are gained. Therefore, this study elaborates on the current understanding of the Chalcolithic populations in southwest Cyprus, through a discussion of the pathological lesions observed on the skeletal tissue and their possible associations with the interpretations based on the archaeological evidence. As bioarchaeology aims to present biological data in a problem-oriented framework, this thesis provides a case study for this methodology and examines questions about the social structure of the populations through the interpretations of the results of the pathological analyses. This study is the first comprehensive palaeopathological study for the prehistoric periods in Cyprus to use this approach. Previous research into the health and disease status of the prehistoric populations are found in specialist studies which focus on: a specific group within the population (i.e. Le Mort 2000) or a particular pathology or cultural practice (i.e. Fischer and Norén 1989; Harter-Lailheugue *et al*. 2005; Lorentz 2003, 2006, 2008c) or represent a portion of the overall presentation of the human remains from a particular site (i.e. Le Mort 2003). Therefore, by incorporating results from several sites and adding to the discussion and interpretations of the lifeways and social structure, this study presents a significant contribution to bioarchaeological studies for prehistoric populations in Cyprus.

5.6 Implications for the History of Medicine

Placing this study in the wider field of the History of Medicine encourages the interpretation of the pathological lesions with more focus on the individual experience, with the consideration of concepts of pain and community care. The History of Medicine encompasses a wide variety of sources in order to discuss the human experience with disease and healing, therefore in prehistory, where there is no textual sources and limited pictorial or figural sources, the human remains provide the best resource for gaining an understanding of the disease processes present within a particular population. In his seminal work, *The Greatest Benefit to Mankind*, Porter discusses the extent of human interaction with disease, claiming that 'all societies possess medical beliefs: ideas of life and death, disease and cure, and systems of healing' (1997: 9). Interestingly, his synthesis on disease and medicine begins in antiquity with the ancient Greeks, bypassing the earliest peoples (Porter 1997: 14). If disease is an important part of all societies' experience and existence then exploring the types and nature of disease processes within a prehistoric population provides an additional strand of research to gain greater understanding of the life experiences and lifeways of that particular population. Therefore, this study fills the lacuna in the current histiography of disease studies on Cyprus for the Chalcolithic period and provides an idea of the disease processes and physiological stresses faced by the populations living during this period.

5.7 Further Research Avenues

The palaeopathological analysis conducted for this study answered a number of questions regarding the accessibility of pathological information from the poorly preserved remains, the types of pathologies present within the Chalcolithic populations, the patterns of prevalence of pathologies amongst the populations and possible interpretations of the pathological prevalence regarding social structure, namely the division of labour. However, it has also raised a number of further questions including: 'who' is buried within the Souskiou-*Laona* cemetery? Are the three different Chalcolithic populations in the southwest of Cyprus examined biological related? What kind of diet was consumed by each site? Are there true differences in diet across the three sites? Is there a definable social stratigraphy within the populations? If so, how are the different groups defined and can this be observed in the type, prevalence and distribution of pathologies on the human skeletal remains? What do the burial programmes at each site indicate in regards to social structure and/or belief systems of the Chalcolithic populations? How does the health status of the Chalcolithic peoples compare to that of the preceding Neolithic and succeeding Early Bronze Age periods? There are several avenues of future research which can be pursued to attempt to provide answers and add to the discussion of these questions which are provided in the paragraphs below.

There is still much work to be done on the Chalcolithic human skeletal material, particularly at Souskiou-*Laona*. The human remains from Souskiou-*Laona* are in the process of being inventoried, examined and published by K. O. Lorentz (*in preparation a*). As the results of this thesis do not include the complete skeletal sample from Souskiou-*Laona*, future work should include all the skeletal material from the site with the hope of creating a more complete demographic profile[110]. There is possible selection bias in the methodology used here as only secure contexts were examined from Souskiou-*Laona*. However, less secure burial contexts and highly commingled and fragmentary skeletal material, typically, provides less information due to issues of preservation and limited demographic information (i.e. Blau 2001). Given the commingled nature of the skeletal material, it was important to approach each skeletal element as a discrete unit of information. However, the articulated discrete skeletons allow for a more in-depth interpretation of pathological prevalence amongst the different biological groups as demographic information can be associated with particular pathologies and further, with an entire skeleton (something which does not occur at any of the Chalcolithic samples examined) diagnosis of a disease or pathology is possible. Analysis of the articulated individuals also permits possible individual life histories to be formed and discussed. However, if commingled skeletal

[110] As discussed in Chapter two, certain contexts were not secure due to looting of the site and it was decided to focus on the bones from the most secure contexts. The contexts not included within this study are the upper fills of all the tombs with commingled skeletal material and skeletal material within looted contexts (see Crewe *et al.* 2005 for more information regarding tomb status). Tomb 228 is the only exception as it was looted while the tomb was under excavation. However, while this meant that the bones were not associated with a particular feature of the burial within the tomb, it did not commingle skeletal material from other tombs.

material is present, careful excavation and recording of the discrete skeletal elements can permit greater depth of interpretation of burial practice. Because of consistent and detailed recording during excavation, the Souskiou-*Laona* cemetery collection will provide much more information regarding burial practice as the mode of deposition of the remains is better understood (Lorentz *in preparation a*).

The issues with bone diagenesis have encouraged feasibility tests on the skeletal material from the Chalcolithic period for chemical isotopic analysis (Cook *et al. in preparation*). Much more information regarding diet, from carbon and nitrogen, and mobility, from strontium and oxygen, can be ascertained from these studies and will shed further light on the lifeways of the Chalcolithic peoples (i.e. Beard and Johnson 2000; Choy *et al*. 2010; Kellner and Schoeninger 2007; Klepinger 1992; Price *et al.* 1985; Richards *et al.* 2003; Triantaphyllou *et al.* 2008). Hopefully, with further advances in the archaeological sciences, the poor preservation and bone diagenesis will not prohibit these studies. As well, palaeoparasitological analyses will need to be completed to hopefully present a wider and more detailed idea of the types of parasites which may have been affecting the Chalcolithic peoples. With these analyses in mind, soil samples from the pelvic and cranial areas have been retained for analysis. With the recent advance in analytical methods, future excavations of human remains in Cyprus would do well to retain soil samples for palaeoparasitological analysis. With time, careful excavation, and an emphasis on human remains studies, Cyprus could achieve a detailed histiography regarding diseases and their causes on the island.

The teeth may be useful in future studies where high magnification microscopy is being utilised. As well, dental histology to investigate the timing of the disruptions of enamel formation leading to linear enamel hypoplasias would provide greater insight into childhood physiological stress in Chalcolithic Cyprus. Further analyses of the correlation between ante-mortem tooth loss, dental caries and apical abscesses may be useful in determining a clearer concept of the prevalence of periodontal disease. Evidence of periodontal disease was not particularly prevalent within the skeletal samples studied for this research. However, as mentioned in Chapter Two, this is due to the poor preservation of the alveoli making it difficult to assess. Histological and chemical analyses of the microstructures within calculus build-up would be an interesting and innovative method of further expanding the current information on diet and food preparation within the Chalcolithic period. Another aspect, which while not pathological in nature, could be pursued, is evidence of non-masticatory uses of the teeth. There is possible preliminary indications of unusual tooth wear which requires a thorough examination and analysis to discuss possible interpretations of the changes for the use of the teeth as tools or a 'third hand' (i.e. Eshed *et al.* 2006; Molleson 2006). These analyses will then allow for a greater understanding of the lives and lifeways of the people living during the Chalcolithic period.

As discussed above, dental non-metric traits can be useful in establishing 'who' was buried at Souskiou-*Laona* and whether there is biological affinity amongst the Chalcolithic Cypriot populations, as well as whether there is any affinity to surrounding cultural groups such as those in the Levant. Craniometric analysis could also possibly provide a further avenue of research along these lines (however the poor preservation and incomplete nature of the crania at Souskiou-*Laona* may make this kind of study difficult). Studies of this nature can be compared to the preceding and succeeding cultural periods to assess the level of continuity of the populations at a particular site, which can be used along with strontium and oxygen analyses to possibly discuss aspects of regional mobility amongst the populations. Regional mobility assessment, using strontium and oxygen isotope analyses may also contribute to palaeopathological studies by possibly providing an understanding of the spread of a particular disease along with the movement of a population or individuals with the population (i.e. Beard and Johnson 2000).

While osteoarthritic changes were examined for this study, analysis of the accentuated entheses or musculo-skeletal stress markers in future studies will likely provide a greater depth of understanding of the range of activities and division of labour within the Chalcolithic period (i.e. Eshed *et al.* 2004a; Molleson 2007a). A more precise representation of the muscle groups and joints used repetitively due to routine activities is expressed in the accentuation of the entheses and will possibly allow for a better correlation to the nature and division of specific activities amongst groups within these populations. Analysis of the accentuated entheses may be more easily achieved due to the fact that is doesn't rely on the survival of the articular surfaces which is one of the primary issues affecting the assessment of osteoarthritic changes.

A more detailed understanding of the nature and division of labour will provide a greater depth of understanding of the lifeways and social structure of the Chalcolithic populations as well as contribute to the interpretations of diet and subsistence economy. In terms of gaining a better understanding of the social status of different biological groups within the Chalcolithic populations, studies such as the ones listed above in regards to further artefact interpretation for grave inclusion and for the histological analysis of the teeth to determine, microscopically, the periods of physiological stress in childhood may shed light on health at different stages of life. Along these lines, isotopic analysis relating to weaning times for infants may be of some use for understanding the status of children within the population (i.e. Schurr and Powell 2005).

Currently there are a limited number of comprehensive palaeopathological studies for the various prehistoric periods in Cyprus, however, the repertoire is constantly expanding as pathological studies are conducted on the generally poorly preserved skeletal material (i.e. see Harper and Fox 2008 for references). Therefore, while this study has focussed on the Chalcolithic period (with some comparisons made to earlier periods on the mainland Near East) a further avenue of study has been opened in regards to generating a chronological study of the evolution of disease processes in Cypriot prehistory. Palaeopathological analysis of the human skeletal remains from the Neolithic period and the Bronze Age in Cyprus in comparison to the results of this study for the Chalcolithic period will present a comprehensive image of the evolution of disease and the differences in health status throughout Cypriot prehistory. Therefore, this current study has provided a starting point for comparison and discussion of health and disease in Cyprus, from the earliest periods through to modern times.

5.8 Conclusions

Overall, this palaeopathological study contributes to the understanding of the Chalcolithic peoples on Cyprus through a discussion of the different types and prevalence of pathology observed on the skeletal remains. This extends our understanding of the disease processes affecting the Cypriot communities back into the Chalcolithic, filling in the gap between the Neolithic and Early Bronze Age, for which there are other osteological studies but not extensive palaeopathological studies (i.e. Moyer 2005, 2007; Le Mort 2003). This research can also be placed in the wider frame of the Eastern Mediterranean as providing a point of comparison for future palaeopathological studies of populations from this area during this time period. As noted above, the focus of palaeopathology in the Levantine corridor has tended to focus on the Natufian-Neolithic transition with good results, thus this study presents palaeopathological information for the succeeding technological phase and acts as the first comprehensive point of reference for health and disease in the early prehistoric periods of Cyprus. In regards to palaeopathological studies in general, this research follows a continuously developing tradition and contributes to the discussion of methodological concerns for dealing with commingled skeletal material by approaching the analyses from a discrete skeletal element perspective and adapting the current methods to deal with poorly preserved skeletal material with the inclusion of descriptive scales of analysis.

When combined with the archaeological evidence from this period, the analyses of the pathological markers reflect a population in the Southwest of Cyprus which has a mixed subsistence economy and where there is a division of labour and diet between the sexes based on the joints affected with osteoarthritic changes and the types and prevalence of dental pathologies affecting each sex. Females and males across all three sites possibly shared similar lifestyles, marked by a general limited prevalence of osseous responses to physiological stress, injury or congenital defect on the skeletal remains from all three sites studied. The different demographic profiles of the settlement sites in comparison to the cemetery site (i.e. the majority of individuals from the settlement sites are under the age of 12 years at death, while the majority of individuals from the cemetery are young adults 21-35 years at death), may affect the distribution of pathologies amongst the three sites and reflect differences in burial practice based on age at death. However, given that these are discrete skeletal populations and there are individuals from all age groups derived from all sites, further analysis into burial practice is needed to discern aspects of burial practice in association with age at death. The greatest proportion of adult individuals from the Chalcolithic period died in their early to mid-twenties, which is not uncommon in prehistoric populations (i.e. Boldsen 2007: 64; Preston 1997:30). The types, nature and levels of expression of pathological lesions on the skeletal remains examined for this study of the Chalcolithic peoples on Cyprus indicate similar lifeways with no indication of social stratification across the island and in general suggest that the populations were fairly healthy, with low prevalence and mild expression of pathological lesion.

Appendix A: Cypriot Chronology

Cultural Period	**Chronological Dates**	**Author of dates**
Akrotiri Phase	10,665+/-25 BP	Simmons 1999
Cypro-PPNA	8800-8600 cal BC	Manning *et al.* 2010
Cypro-PPNB/Early Aceramic Neolithic	8200-7000 cal BC	Peltenburg 2003; Guilaine and Briois 2005
Khirokitian Culture/Late Aceramic Neolithic	c.7000-58/5500 cal BC	Le Brun 2001; Knapp 1994; Todd 2005
Sotira Culture/Ceramic Neolithic	4700-3900 cal BC	Clarke 2007
Erimi Culture/Early Chalcolithic	4000-3400 cal BC	Peltenburg 2003
Erimi Culture/Middle Chalcolithic	3400-2900 cal BC	Peltenburg *et al.* 1998
Erimi Culture/Late Chalcolithic	2900-2500 cal BC	Peltenburg *et al.* 1998
Philia Phase	2500-2350 cal BC	Peltenburg *et al.* 1998; Swiny 2001
Early Cypriot/Early Bronze Age	2500-2000 cal BC	Swiny 2001
Middle Cypriot/Middle Bronze Age	2000-1600 cal BC	Swiny 2001
Late Cypriot/ Late Bronze Age	1600-1050 cal BC	Swiny 2001
Iron Age (including Cypro-Geometric, Cypro-Archaic and Cypro-Classical)	c.1050-325 cal BC	Swiny 1989
Hellenistic	325-30 BC	Swiny 1989
Roman	30 BC – AD 330	Swiny 1989
Early Christian and Byzantine	AD 330-653/ 965-1191	Swiny 1989
Frankish Lusignan	AD 1192-1489	Swiny 1989
Venetian	AD 1489-1571	Swiny 1989
Turkish	AD 1571-1878	Swiny 1989
British	AD 1878-1960	Swiny 1989
Republic of Cyprus	AD 1960-	Swiny 1989

It is important to note here that there is still great debate regarding the chronological dates as they relate to the cultural phases. The table presented here uses the dates gathered from several site reports and general syntheses about particular periods, however more excavations, more radiocarbon dates and refinement of artefact typologies continually are redefining the chronological periods in prehistoric of Cyprus.

Appendix B: Chronology of the Chalcolithic Created by Peltenburg (1998)

Peltenburg has identified seven cultural periods of stratigraphy at Kissonerga-*Mosphilia* (Bolger *et al.* 1998: 4-21). An extensive group of radiocarbon dates were taken from a number of different secure contexts with emphasis on defining the Early to Middle Chalcolithic periods (Bolger *et al.* 1998: 5-6). The complex stratigraphy of the site has provided dates for the cultural material recovered and has allowed for greater understanding of the socio-cultural climate in the Southwest settlements of the Chalcolithic. As well, the secure dating has allowed for a greater depth in understanding technological evolutions within this population.

The table below presents a list of the cultural periods from Kissonerga-*Mosphilia* (from Bolger *et al.* 1998: Table 2.3 p. 13-15)

Period	Cultural Phase	Chronological Period
1A	Aceramic Neolithic	
1B	Late Ceramic Neolithic	
2	Early Chalcolithic	
3A	Early Middle Chalcolithic	
3B	Middle Chalcolithic	
4	Late Chalcolithic	
5	Philia/Early Bronze Age	

Appendix C: Human Remains in a Sample of Archaeological Sites in Cyprus

This table presents a list of a sample of 68 archaeological sites in Cyprus which were examined to discuss the general prevalence of human remains in archaeological sites and the percentage of site reports which include reports on the human remains. The purpose of this is to demonstrate that while human remains are often recovered from archaeological sites in Cyprus, they are often not analysed and discussed within the reports to any great extent.

The dates for the cultural periods can be found in Appendix A. The shorthand used is explained here: Cypro-PPNB=Pre-Pottery Neolithic B; ANeo= Aceramic Neolithic; CNeo=Ceramic Neolithic; EChal=Early Chalcolithic; MChal=Middle Chalcolithic; LChal=Late Chalcolithic; Philia=intervening phase between Late Chalcolithic and Early Bronze Age; EBA=Early Bronze Age; MBA=Middle Bronze Age; LBA=Late Bronze Age; IA=Iron Age; Cypro-Geo=Cypro-Geometric Period; Cypro-Arch=Cypro-Archaic Period; Hel=Hellenistic; Rom=Roman; LRom=Late Roman; Byz=Byzantine; Med=Medieval; Christian=Christian periods.

Site Name	**Dates of Excavation**	**Cultural Periods**	**Human Remains Present?**	**Description of Human Remains**	**Reference**
Akrotiri – *Aetokremnos (Site E)*	1987-1990	Akrotiri Phase	No		Simmons 1999
Akrotiri – Vounarouthkia ton Lamnion (Site 2)	1990	Akrotiri Phase?	No		Simmons 1999
Akrotiri – Limassol Lighthouse (Site 3)	1990		No		Simmons 1999
Akrotiri – Vounarouthkia ton Lamnion East (Site 23)	1990		No		Simmons 1999
Kissonerga – *Mylouthkia*	1976-1996	Cypro-PPNB; EChal; Mchal	Yes	Human remains recovered from both the PPNB and EChal	Fox *et al.* 2003
Kissonerga – *Mosphilia*	1979-1992	Aneo; Cneo; EChal; MChal; EBA.	Yes	Human remains date mostly to the MChal	Lunt *et al.* 1998
Khirokitia - *Vounoi*	1934-1946; 1972; 1977 -	Aneo; Cneo	Yes	Several publications include human remains reports	Angel 1953; Le Mort 1994, 2000
Kritou Marottou – *Ais Yorkis*	1997; 2002 -	Aneo	Possible	Pers. Comm. with P. Croft mentioned human remains but does not appear in publications	Simmons 2005
Kholetria - *Ortos*	1992-1994	Aneo	Yes	Commingled material with animal bones - MNI=4 indeterminate sex, 2 adults & 2 sub-adults recorded	Fox 1993 in Cooper 1997
Lemba - *Lakkous*	1976-1983	Cneo; Chal	Yes	Human remains date mostly to the MChal	Lunt 1985

Site Name	**Dates of Excavation**	**Cultural Periods**	**Human Remains Present?**	**Description of Human Remains**	**Reference**
Kalavasos - *Tenta*	1976-1979; 1984	Aneo; Cneo; (BA, LRom)	Yes	14 burials with 18 individuals recovered	Moyer 2005
Ayia Anna – *Perivolia*	1981-1982	Aneo; Cneo-Rom	No	Mostly surface survery done	Baudou and Engelmark 1983
Dhali – *Agridhi* and Ancient Idalion	1971 - 1980	Aneo; Cneo; Cypro-Geo-Rom	Yes	various tombs dating from the MBA to Hel pds discovered over years	Charles 1964; Schulte-Campbell 1989
Klepini – *Troulli*	1941	Aneo; Cneo	No		Peltenburg 1979b
Limnitis – *Petra Tou Limniti*	1929	Aneo	No		Gjerstad 1934b
RizoKarpaso – *Cape Andreas-Kastros*	1970-1973	Aneo	Yes	Three tombs w 4 individuals	Solivères 1981
Ayios Epiktitos - *Vrysi*	1969-1973	Cneo	No	Site was under excavation in 1974	Peltenburg 1982a
Parekklisha - *Shillourokambos*	1992-1999	Aneo	Yes	From Structure 23, a 5x5 m pit and 2 m deep at 1.8 m, an aged male placed in a contracted position lying above the partial remains of at least 3 other individuals, represented only by cranial frags and some long bones.	Crubezy *et al.* 2003; Guilaine and Briois 2001; Harter-Lailheugue 2005
Kantou - *Kouphovounos*	1992-1999	Cneo	Yes	Two pit graves from house 15 - one infant skull and teeth, one adult male, flexed and articulated neither with grave goods -found within the house walls and debris on top; human teeth in fill from house 1 in sector B	Mantzourani 2003
Kalavasos - *Kokkinogia (Site A)*	1947; 2002-	Cneo	No		Clarke 2004
Kalavasos - *Pampoules (Site B)*	1947; 2002-2003	Cneo; Chal	No		Clarke 2004
Sotira-*Teppes*	1947; 1951-52; 1954; 1956	Cneo	Yes	Graves within the settlement, extramural, shallow pits with flexed individuals - 8 skulls	Angel 1961
Philia - *Drakos* Site A	1965-1970	Cneo	Yes	3 individuals	Walker 1975
Paralimni - *Nissia*	1995 - 1998	Cneo	No		
Erimi - *Bampoula*	1933 - 1935; 1980	Chal	Yes	3 graves with 4 skeletons, 3 adults & 1 subadult	Bolger 1988; Guest 1936
Souskiou - *Vathyrkakas*	1972	Chal	Yes	cemetery	Peltenburg *et al.* 2006; Lunt 1994
Souskiou - *Laona*	2001 -	Chal	Yes	cemetery	Crewe *et al.* 2005
Ampelikou - *Agios Georgios*	1942; 1953	Chal	No	Referred to as Site B by Dikaios in a brief mention	Dikaios 1945

Site Name	Dates of Excavation	Cultural Periods	Human Remains Present?	Description of Human Remains	Reference
Philia - *Drakos* Site B.	1943	Chal	No	4 tombs from the 'Copper Age' - no mention of bones, only that tombs were cleared	Dikaios 1945
Maa – *Palaekastro*	1979-1986	Chal; LBA	No	Chal tombs are described but empty	Karageorghis and Demas 1988
Kalavasos - *Ayious*	1978-1980	Chal; MBA; (LBA-Rom)	Yes	no complete skeletons - MNI=3 - small , poorly preserved and fragmentary and incomplete - no pathology found (explicitly noted that it was looked for)	Moyer 2004
Prastio - *Agios Savvas tis Karonis Monastery*	1992 - 1995	Mchal; CNeo-Rom	Yes	Remains date from the Chal - ossuary with poorly preserved disarticulated remains of at least 7 inds - likely secondary burial found with picrolite pendant and dentalium shells	Fox 1999
Kalopsidha	1959	EBA	Yes	very poor - 90 frags from Trench 3 and perhaps various other frags in misc trenches	Gejvall 1966
Ampelikou - *Alekri*	1942	EBA	Possible	Referred to as Site A by Dikaios	Dikaios 1945
Vasilia	1955	EBA	No	Nothing listed in the publication, yet as it is a cemetery site, one would assume that there was human remains - excavated 4 tombs 3 of which were in poor condition	Hennessy, Eriksson and Kehrberg 1988
Agia Paraskevi	1955 -	EBA - IA	Yes	Excavated by Stewart - bones are mentioned in tomb discription, but no catalogue, very poor condition.	Hennessy, Eriksson and Kehrberg 1988 Kromholz 1982
Sotira - *Kaminoudia*	1981 - 1993	EBA	Yes	From the cemetery sites and settlement - 13 individuals - crania similar to those of Sotira-Teppes.	Schulte-Campbell 2003
Bellapais - *Vounous*	1931-1932; 1933; 1937 - 1938	EBA	Yes	Images of human remains, but no discussion.	Stewart and Stewart 1950
Lapithos - *Vrysi tou Barba*	1931	EBA; MBA	Yes	Seem to be in poor condition, many tombs contained burials - each tomb has a section on burial which comments on preservation and on occasion the bone elements contained within - primary discussion is about grave goods and tomb construction.	Gjerstad 1934c
Marki - *Alonia*	1990 - 2000?	EBA; MBA	Yes	Final report includes MNI=20 at the settlement & 3 tombs of the *Davari* cemetery	Moyer 1997; Moyer, Fox and Lorentz 2006
Deneia	1930's, 1953, 2003-2004	EBA, MBA, LBA, IA	Yes	Though it seems that there was more skeletal remains recovered, only Tomb 789 is published in its entirety in the final report	Tucker and Cleggett 2007
Hala Sultan Tekke	1968; 1971 - 1998	EBA; MBA; LBA	Yes	11 individuals as of 1974 and possibly more with later excavations	Schwartz 1974

Site Name	Dates of Excavation	Cultural Periods	Human Remains Present?	Description of Human Remains	Reference
Psematismenos-*Trelloukkas*	1982	MBA	Yes	Tomb chamber with few skeletal remains - minimum of 3 indiviudals	Moyer 1985
Kalavasos - *Bronze age cemetrery*	1978	MBA	Yes	41 tombs with 78 individuals with almost no infants or children - most adults could be sexed - pathologies examined	Moyer 2007
Mesoyi-*Katarraktis*	1988	MBA	Yes	Chamber tomb found with pottery which provides date - 2 adults	Herrscher and Fox 1993
Nitovikla/Paleoskoutella/Kountoura *Trachonia*	1929	MBA; LBA	Yes	Nitovikla is a fortress structure w a necropolis (from LBA) - Paleoskoutella and Kountura Trachonia are cemeteries nearby (MBA-LBA) - skeletal remains mentioned in regards to preservation and deposition with focus on grave goods and tomb structure	Gjerstad 1934e
Kalavasos - *Ayios Dhimitrios*	1979-1987	LBA	Yes	11 tombs, most with severe looting - 34 individuals, with bones examined for sex, age and pathologies with description of abnormalities in the bone given	Moyer 1989
Ayios Iakovos - *Moutti tou Kakotri*	1959	BA	No	Tomb uncovered (Tomb 15) but only list of finds within - no mention of human remains	Astrom 1966
Episkopi - *Phaneromeni*	1955; 1975 - 1978	MBA; LBA	Yes	Grave goods and finds discussed within the tombs, one paragraph p.58 mentions the skeletal remains in regards to body position.	Duryea 1965
Alambra	1976 - 1982	MBA	Yes		Domurad 1996
Enkomi - *Alasia*	1932 - 1935; 1946 - 1974; 1948 - 1958	MBA; LBA; Cypro-Geo	Yes	Enkomi necropolis was partially excavated by the SCE in 1930 - skeletal material mentioned in burials and recorded how its positioned and state of preservation (with rare exception sex is given)- again mostly focussed on the grave goods and tomb structure - tombs were dated to Late Cypriote II.	Gjerstad 1934d
Kition	1959 - 1976	LBA; Cypro-Geo-Hel	Yes	11 individuals as of 1974 and possibly more with later excavations	Schwartz 1974
Kouklia - *Palaepaphos*	1967 - 1995	LBA; Cypro-Geo-Med	Yes	There is no comprehensive discussion of the human remains with the tomb descriptions. Bones are mentioned within the tomb description.	Fox 2001; Karageorghis 1990
Ancient Kourion (Bamboula)	1937-1939;; 1951-1954; 1967-1970; 1974-1982; 1984-1987; 1995-2000	LBA; Cypro-Geo-Med	Yes	At the Amathous Gate cemetery - Hel-Rom dates. And LBA skeletons examined by Angel.	Angel 1972a; Chapman 1998, 1999; Galloway 1985; Harper 2000

Site Name	Dates of Excavation	Cultural Periods	Human Remains Present?	Description of Human Remains	Reference
Ktima - *Iskender*	1953 - 1955	Cypro-Geo; Cypro-Arch	Yes	Crania from the site studied	Charles 1963
Amathous/ Amathus	1975 - 2003; 1991 - present	Cypro-Geo-Rom	Yes	Molk sacrifice and Tophet burials - Phonician, 23 jars with human bones within with a total of 55 inds mostly infants and children mostly cremated (in Agerlakis). Other remains from other areas in other reports - 25 tombs excavted in necropolis, 800m west of acropolis on both sides of road Nicosia to Limassol in 1930.	Agerlarakis, Kanta and Stampolidis 1998; Domurad 1992; Tytgat 1995
Nicosia - *St. George's Hill (PA.SY.D.Y)*	1985; 1996 -	Cypro-Arch-Hel; Med	Possible	Refers to tombs which were located to the south of the settlement but does not mention excavation there in 2003 publication but recent presentations by S. Fox at Medicine in the Ancient Mediterranean World Conference indicates otherwise	Pilides 2003
Salamis Necropolis - *Cellarka* and *Koufomeron*	1962 - 1967	Cypro-Geo-Byz	Yes		Charles 1967a and b
Agios Georgios Tis Pegias - *Geronisos*	1990 - 2002	Chal; Hel; Rom; Byz	Yes	Pers. Comm. with P. Croft mentioned human remains but does not appear in publications	Connelly 2005
Arediou-*Vouppes*	1993, 2004-	LBA	No		Steel and James 2005
Stylli	1930	Cypro-Geo; Cypro-Arch	Yes	17 tombs excavated, body position and poor preservation was noted	Gjerstad *et al.* 1935
Marion - *Kaparka, Potamos tou Myrmikof, Sikarka-Kokkina, Evrethades*	1929	Cypro-Geo to Byz	Yes	4 necropoli with a number of tombs - all skeletons found discussed in terms of preservation and deposition - focus on grave goods	Gjerstad *et al.* 1935
Kato Paphos - *Nea Paphos*	1962 - 1995; 1988 - 1999	Cypro-Hel-Med	Yes		Domurad 1988
Pegeia	2001	Hel	Yes	A chambered tomb with 8 loculi, lots of goods found with with 11 individuals	Harper 2002
Agios-Georgios tis Pegeias	1949, 1954, 1991-2000	Hel; Rom	No	28 rock cut tombs w no skeletal remain	Anastasiadou 2000
Kambi *Vasa*	1940-1948	Rom	Yes	5 skulls from Kambi Vasa are compared to other contemporaneaous ones	Angel 1955
Pyla-*Koutsopetria*	2003-	LRom	No		Caraher *et al*. 2005
Alassa - Ayia Mavri	?	Christian ?	Yes		Fox 1996

Appendix D: Description of the discrete skeletons from Souskiou-*Laona* cemetery with particular reference to the pathology

**Note please that unless otherwise indicated, age estimation was based on molar wear (Miles 1963) or dental development (Ubelaker 1989) and sex determination was almost solely based on cranial features (Buikstra and Ubelaker 1994). If the pelvic bones were present, sex was assessed based on them (Brooks and Suchey 1990; Phrenice 1969). The 'B#' in brackets represents the context number arbitrarily assigned to a specific burial context within the tomb, as determined by the excavator and the on-site physical anthropologist. This number is for reference with the excavation records only and does not necessarily reflect a discrete individual.

A total of 27 tombs containing a minimum of 125 individuals were examined from Souskiou-*Laona* cemetery for this study. Within the tombs at Souskiou-*Laona*, the skeletal remains are deposited in a variety of burial contexts (i.e. articulated skeleton, disarticulated skeleton, cranium, bonestack or commingled skeletal material). This appendix contains a description of each of the 107 discrete skeleton contexts derived from Souskiou-*Laona*. Each skeleton or cranium is assigned a letter which corresponds to the excavation records and is described in regards to the skeletal material present, the general preservation levels of the skeletal material and the pathologies observed on the skeletal tissue. The purpose of this appendix is to provide a synopsis of each discrete individual and their particular pathological expression.

<u>**Tomb 108**</u>

North Skeleton (B98 and B99) was articulated and represents an adult female aged 30-34 years at death. Surface preservation of the bones is moderate, chalky with some eroded portions. However, the teeth are in quite poor condition. Approximately 75.0% of the skeleton is present, including about 75.0% of the cranium. Most body parts are represented bilaterally to an extent. All long bones are present as well as the shoulder girdle and metatarsals. There are only fragmentary remains of all the vertebrae, the pelvic girdle and very few ribs and hand bones recovered. There were 13 maxillary and five mandibular teeth examined, of which 11 are in position and seven are loose. North Skeleton has evidence of mild dental disease. The left maxillary second molar displays supragingival calculus on the buccal surface of the crown and two carious lesions. The right maxillary second incisor also has a carious lesion on the distal aspect of the tooth. The left and right maxillary first molars both display a mild LEH in the cervical third of the crown and heavy attrition which means that the LEH is only visible on the buccal surface. This heavy attrition is also noted on the right maxillary first premolar. The pulp chambers of these teeth are not open. Of the 13 maxillary teeth present, two display dental caries, two display LEH and one displays calculus. None of the mandibular teeth appears to be affected. In regards to postcranial pathology, one cervical vertebra displays osteophytic projections from the anterior margin of the body. There are only fragments of the cervical vertebrae present, none of which display any osteophytic changes, nor do any thoracic or lumbar vertebrae. There is no evidence of trauma. This appears to be localized. However, given the general preservation of the vertebrae it may simply not be possible to determine the number of elements affected. The head of the complete right radius is re-modelled indicating a poor articulation with the distal end of the humerus. The superior aspect has lost its concavity and the articular facet has an S-shaped remodelling and there are osteophytic projections from the inferior aspect most likely due to a poor articulation. The right ulna does not appear to have any pathologies and the distal epiphysis of the right humerus is missing. There is no evidence of trauma. The left elbow joint does not seem to be affected with any osteoarthritic changes. Therefore the right elbow of this individual would possibly have had some loss of the ease of movement.

South Skeleton (B97 and B100) was disarticulated in the south end of the tomb and represents an adult female aged 18-26 years at death. Surface preservation of the skeletal material is moderate: chalky with some eroded areas. Approximately 60.0% of the skeleton is present, including about 50% of the cranium. None of the leg long bones are present. All other body parts are represented bilaterally to some degree, with much of the pelvic girdle, spine and small bones of the feet/ankles missing. There were nine maxillary, 14 mandibular teeth and one unidentified tooth examined, of which 11 teeth are in position. This individual displays evidence of dental disease in the form of carious lesions on three molars: the right maxillary first molar and the right mandibular first and third molars. All three occur on the occlusal aspect of the crown. In regards to postcranial pathologies, the radial notch of the left ulna is slightly extended towards the posterior indicating a possible slight poor articulation with the radial head. The left radius does not display any pathological changes, nor does the left humerus. There is no evidence of osteoarthritic changes on the right elbow joint and there is no evidence of trauma to any of the arm and hand bones recovered. The distal epiphysis of an intermediate foot phalanx is remodelled and flattened. This is the only intermediate foot phalanx recovered and there is no evidence of pathology on any of the five proximal foot phalanges. There is no evidence of trauma, but a radiograph is required to be certain.

Tomb 125

Cranium A (B319) is an adult. The general robusticity of the cranial elements would suggest male, but it is inconclusive. No teeth were recovered therefore no age estimation is possible. Surface preservation of the cranial bone is moderate: chalky with some eroded areas. Approximately 45.0% of the cranium is present, predominately calvarial fragments from the right side. The parietal fragments are very robust with a large diploic space and thick external and internal bone layers, which is up to 11.5mm thick at points. Thickened calvarium can reflect a number of possible causes including, normal genetic variation, infectious diseases, metabolic disorders or hematopoietic diseases. There were no conclusive pathologies observed on the cranial fragments.

Cranium B (B320) is a subadult. This context is represented by a very small amount of indeterminate cranial fragments. Approximately 2.0% of the cranium is present. It is highly fragmentary, poorly preserved and very thin which indicates that the individual was a subadult. No assessment for pathologies was possible with this material. Given the number of subadult cranial elements which seem to occur within different contexts, particularly with Crania F, I and J, this cranium may represent fragments of another individual.

Cranium C (B321) is an adolescent aged 16-20 years at death based on dental development. Surface preservation of the cranial bone is predominately moderate and the teeth are in fairly good condition. The cranium is only about 30.0% complete, mostly calvarial from the right side which is slightly better preserved than the left. There were 11 maxillary permanent teeth recovered which are possibly associated with Cranium C. Of these teeth, there are two left first and second molars and a right first molar and there are three right second molars present (meaning there are a minimum of three individuals within this context). These teeth are all at relatively the same stage of development which makes it impossible to determine which ones belong to Cranium C. The only pathology observed is a large circular caries on the mesial aspect of a right second maxillary molar. There is no further evidence of dental disease.

Cranium D (B440) is an adult female aged 34-42 years at death. Surface preservation of the cranial bone is moderate: chalky with some eroded areas. However, most of the teeth are in very poor condition. More than half of the teeth could not be assessed for pathologies. The cranium is approximately 45.0% complete, represented predominately by calvarium which is highly fragmentary. There were 15 maxillary and three mandibular permanent teeth examined, all of which are loose. A left incus was also recovered in the cranial excavation. There is no evidence of dental disease and there were no pathologies observed on the cranial bone.

Cranium E (B429) is a female aged 22-28 years at death. Surface preservation of the bones and teeth is moderate: chalky with some eroded areas. However, the bones are highly fragmentary. Overall, the cranium is approximately 40.0% complete, represented predominately by calvarial fragments. The fragmentation of the bones makes assessment impossible in two cases. There were 12 maxillary and three mandibular permanent teeth examined, all of which are loose. The frontal bone has retained its metopic suture into adulthood. The maxillary left and right first premolar, along with the left maxillary lateral incisor and right mandibular canine all display a mild to moderate LEH in the occlusal or middle third of their respective crowns. This indicates that the individual experienced at least one physiological stress in childhood. The right maxillary lateral incisor and the left mandibular canine were not recovered to assess for bilateral expression of LEH.

Cranium F (B439) includes of the remains of at least three individuals: two children and an adolescent. Surface preservation of the bones and teeth is predominately moderate: chalky with some eroded areas. Both children are aged three to five years at death (based on dentition) The material could not be separated for these two individuals and includes a left and right petrous portion of the temporal, two maxillae with anterior teeth in position, two frontal bones and calvarium fragments as well as two right first maxillary molars, two right maxillary canines, lateral and central incisors, all of which are developing and predominately in position. The adolescent is represented by a right temporal fragment, frontal and maxilla and calvarium fragments as well as both maxillary first premolars, the left maxillary canine, the mandibular first premolar, both mandibular canines, the right lateral and central mandibular incisors and a mandibular second premolar which displays a large carious lesion on the distal half of the crown. There is an intrusive right third mandibular molar which displays a small caries on the distal aspect of the crown at the cemento-enamel junction. This tooth is most likely not associated with any of the individuals within this context based on age estimation. Due to the mixing of skeletal material within this tomb, it is difficult to determine which fragments are associated with which individual and so some of these fragments belong with another cranium and certainly with postcranial material in the bonestack. There is no further evidence of dental disease and there were no pathologies observed on the cranial bones.

Cranium G (B425) is a young adult aged 22-28 years at death with no sex assessment possible. Surface preservation of the cranial bones is predominately moderate: chalky with some eroded areas. The teeth, which still have their crowns, display moderate surface preservation. Only 20.0% of the cranium has survived and it is highly fragmentary. There were six teeth examined, two left maxillary molars, a right mandibular premolar and molar and two indeterminate fragments. All are loose. There is no evidence of dental disease. The atlas and axis were recovered with this cranium as well. The only pathologies observed on the bones relate to the atlas and axis vertebrae which show osteophytic growth on the dens facet and superior aspect of the dens, respectively. Because these two vertebrae were found together and with the cranium, it is likely that they all belong to the same individual. No further pathologies were observed.

Cranium H (B415) is an adult with neither age estimation nor sex determination possible. Surface preservation of the cranial bones is moderate: chalky with some eroded areas. There are primarily calvarial bones present as well as a mandible fragment, all in a highly fragmentary state. Approximately 5.0% of the cranium is present. There were no teeth examined. The cranium is so badly fragmented that over half of the bones cannot be assessed for pathologies. There were no pathologies observed on those that could be assessed.

Cranium I (B442) belongs to an indeterminate subadult individual. Surface preservation is moderate: chalky and eroded. It is represented by three cranial bones, with no teeth. Approximately 5.0% of the cranium is present in a highly fragmentary state. There were no pathologies observed. Due to the fragmentary nature and the small amount of bone recovered, it is possible that this cranium belongs with another cranium, such as J or B which also include subadult remains.

Cranium J (B441) represents the remains of at least two individuals: a child and an adult. Surface preservation of the bones is good to moderate: with chalky surfaces but minimal erosion. The cranial bones are highly fragmentary. The child is aged three to five years at death and is represented by: an occipital condyle, indeterminate calvarial fragments, a deciduous left maxillary canine, a maxillary left developing permanent canine and lateral incisor, and a deciduous left maxillary first molar. The adult is a female with no age estimation possible. Approximately 20.0% of the cranium is present, along with the hyoid, three auditory ossicles and a maxillary right central incisor. There were no pathologies observed on either group of cranial elements or any of the dentition.

Tomb 132

Skeleton East (B101) is a probable male aged 24-36 years based on dental wear. There were other remains which do not belong to Skeleton East commingled with the individual's remains. Surface preservation of the bones is predominately moderate: chalky with some eroded areas. However, the teeth are in poor condition with severe erosion. The bones, other than the leg long bones, are not particularly fragmentary. Of the skeletal material associated with this individual, 17.5% could not be assessed for pathologies. Skeleton East is approximately 75.0% complete, including about 20.0% of the cranium plus the mandible. Some body parts are represented to some degree bilaterally with the exception of the ankles and feet which are completely absent. The leg long bones, pelvic girdle and vertebrae are in poor condition and only partially present and there is only one carpal present. The missing feet and ankles are most likely found within the bonestack material. There were 16 maxillary and 16 mandibular teeth examined, of which six mandibular and three maxillary teeth are in position. The maxillary first molars both display large carious lesions on the occlusal aspect of the crown. The alveoli of the maxillae could not be assessed for periodontal disease. There is no further evidence of dental disease on any of the teeth. Osteoarthritic changes affect two body parts, represented by four bones. Two left metacarpals, the first and fifth, both display osteoarthritic changes to the proximal epiphysis in the form of osteophytic growth at the margins, possibly reflecting poor articulation. There is no evidence of trauma and it does not occur bilaterally on the right first and fifth metacarpals. There are no left carpals recovered. As well, two thoracic vertebrae display extension of the articular surfaces and osteophytes on the anterior aspect of the body. There are a number of thoracic vertebrae fragments which do not display any pathological changes. These bones are highly fragmentary however, so the number of vertebrae affected is difficult to assess. It seems unlikely that this represents a localised pathology. However, given that there is no evidence of osteoarthritic changes on the cervical vertebrae and the lumbar vertebrae are not present, it is not possible to elaborate on the extent of the pathology. Overall, it is possible that the thoracic spine and two joints of the right hand display localized, mild osteophytic changes, most likely representing general wear and tear on the joints.

Skeleton West (B102) is a probable female aged 28-36 years at death based on dental wear. Again Skeleton West's remains were commingled with other bones. Surface preservation of the bones is moderate: chalky with some eroded areas. However, the teeth are in very poor condition. Overall, 20.5% of all the skeletal material could not be assessed. Skeleton West is approximately 60.0% complete, including about 10.0% of the cranium. All the long bones are present to some degree. However, most of the small bones of the hands/wrists and feet/ankles are missing. The vertebrae, ribs and pelvic girdle are highly fragmentary with only small amounts present and the lumbar vertebrae are not represented. There were 13 maxillary and 16 mandibular teeth examined, of which seven maxillary and seven mandibular teeth are in position. The only pathology observed affects the left second mandibular molar which displays a medium sized caries in the occlusal aspect. Osteoarthritic changes affect two body parts. The right hand is affected, with the first and the fifth metacarpals showing osteophytic growth and remodelling of the distal epiphysis. As well, the right first proximal hand phalanx displays osteophytic growth and remodelling of the proximal epiphysis. There is no evidence of trauma on any of the bones. The left first and fifth metacarpals and first proximal phalanx are not present, nor are any other right metacarpals. The right first distal foot phalanx exhibits osteophytic growth on the proximal epiphysis. There is no evidence of trauma and the right first metatarsal is not present. There is no evidence of pathology on any of the metatarsals or foot phalanges present. Overall, both the right hand and right foot are affected by unilateral, localized mild osteoarthritic changes on one or two joints, most likely representing wear and tear on the joints.

Bonestack North (B103) contained three crania in a highly fragmentary state. *Cranium 1* is an adult with an estimated age of 30-38 years at death. Surface preservation of the bones is quite good: with chalky surfaces. The cranium is approximately 50.0% complete, including three loose maxillary teeth. The maxillary left first molar displays a moderate supragingival line of calculus on the distal aspect of the crown. The right first molar does not display any calculus nor does the left first premolar. There were no other pathologies observed. The left maxillary first molar associated with Cranium 1 may be associated with a mandible from within the bonestack which displays ante-mortem tooth loss of the first mandibular left molar as there is minimal wear on the tooth.

Cranium 2 is an adult with an estimated age of 20-32 years at death. Surface preservation of the bones is predominately moderate: chalky with some eroded areas. However, the teeth are in good condition. The cranium is approximately 50.0% complete, including four in position maxillary left teeth. The left second molar displays a small carious lesion in the distal aspect of the crown at the cemento-enamel junction. There is no evidence of dental disease on the other three teeth recovered and there were no pathologies observed on the cranial bones.

Cranium 3 most likely represents an adolescent, possibly female aged 16-20 years at death. Surface preservation of the bones is fair: chalky with minimal erosion. The two teeth present are in very poor condition, with two missing their crowns. Approximately 10.0% of the cranium is present, including two identifiably left mandibular molars and two unidentifiable root fragments. There is no evidence of dental disease and there were no pathologies observed on the cranial bones.

Tomb 155

Skeleton A (B150) is an adult female aged 24-39 years at death based on dental wear and the auricular surface of the os coxa. Surface preservation of the skeletal material is moderate: chalky with some eroded areas. Overall, 16.5% of the skeletal material could not be assessed for pathologies. Approximately 80.0-85.0% of Skeleton A is present, including about 50.0% of the cranium. All body parts are represented bilaterally to some degree. The vertebrae and ribs are highly fragmentary with only minimal amounts of bone present. About 50.0% of the small bones of the hand/wrists and feet/ankles are missing. There were 14 maxillary and 14 mandibular teeth examined, all of which are loose. The wide range in age estimation is due in part to the minimal wear expressed on the left maxillary second molar. Given that the second left mandibular molar is missing, possibly *in vivo*, a more precise age estimation excluding this tooth is 24-30 years at death. Both the left and right maxillary first molars display a small carious lesion, which are the only pathologies observed. There is no further evidence of dental disease, though the alveolar bone is not present. There were no pathologies observed on the bones.

Skeleton B (B156) represents an adult male aged 18-34 years at death based on the tooth wear and the os coxa. The age estimation, based solely on dental wear, is 18-26 years at death. Surface preservation of the skeletal material is moderate to poor: chalky with eroded areas. Overall, 25.3% of the skeletal material cannot be assessed for pathologies. Approximately 75.0% of the skeleton is present including about 65.0% of the cranium. Most body parts are represented bilaterally to some degree. The cervical vertebrae, a clavicle, a scapula, most of the bones of the hand/wrist and almost all tarsals and foot phalanges are missing. The ribs and os coxae are highly fragmentary. There were six maxillary and nine mandibular teeth examined, of which one maxillary and four mandibular teeth are in position. Skeleton B exhibits evidence of dental disease. The mandible displays possible alveolar resorption, particularly noted between the right first and second molars. However, post-mortem damage limits the assessment. Three teeth display dental caries, the maxillary left first molar and right second premolar exhibit small irregular caries on the occlusal aspect and the right mandibular first molar has a medium sized caries on the mesial aspect of the crown. There were no pathologies observed on the bones.

Tomb 158

Skeleton A (B252, 253, 254) is a male aged 20-26 years at death based on dental wear. Surface preservation of the skeletal material is good: chalky with minimal taphonomic damage. Only 5.1% of the skeletal material could not be assessed for pathologies. Approximately 55.0% of the skeleton is present, including about 15.0% of the cranium. The leg long bones are missing, with the exception of a femur fragment and the distal epiphysis of the right fibula. Most of the hand, wrist, foot and ankle bones are absent as are the majority of the vertebrae. The pelvic girdle is surprisingly well represented, though somewhat fragmentary. Three maxillary and six mandibular teeth were examined, all of which are loose as only fragments of the mandible is present. Both mandibular canines display a single mild LEH in the cervical third of the tooth crown. As well, the maxillary left second molar displays minor supragingival calculus flecks on the buccal surface of the crown. There is no further evidence of dental disease. Osteoarthritic changes are observed on the acromion of the right scapula in the form of remodelled bone to create a new facet on the superior-medial surface possibly indicating a poor articulation. The right humerus is intact and does not display any evidence of pathology and the right clavicle is not present. There is no evidence of trauma. The right first metacarpal exhibits woven bone on the proximal third of the diaphysis making it appear thicker than the distal half, which may reflect trauma. The left first metacarpal does not display any changes and the carpals and phalanges recovered do not display and pathologies. A radiograph is required to determine if there was an incidence of trauma. There is an interesting possible congenital developmental defect where the third and fourth sacral vertebrae are not fully fused. These two vertebrae typically fuse between 18-23 years, and are 80.0% fused by age 20 (McKern 1970; Schaefer *et al.* 2009: 115-121). The fourth and fifth sacral vertebrae are typically 100.0% fused by age 23, as they appear to be in this case. This would indicate that it would be expected that the third and fourth would be fused as well. So depending on where this individual falls within the estimated age range based on the dentition, it could represent a transitional sacral vertebra.

Cranium B (B255) represents at least two individuals: one adolescent and one young adult (with duplication of the right temporal). Cranium B most likely represents a young female adult with no age estimation possible. Surface preservation of the cranial fragments is moderate: chalky with some eroded areas. Approximately 60.0%

of the cranium is present, predominately the calvarium. There were five maxillary teeth examined, of which the right first and second molars are in position and thus belong to Cranium B. The other three teeth, along with the right temporal bone are most likely associated with the adolescent individual which is likely represented by Cranium C. Neither of the molars could be assessed for pathologies as they are missing their enamel post-mortem. There were no pathologies observed on the cranial bones.

Cranium C (B301) is highly fragmentary with only minimal remains present. No features were recovered to assess sex. Again there is a mixing of subadult and adult material. Crania B and C are located in close proximity to each other within the tomb which may have lead to commingling of cranial fragments. Most likely Cranium C represents an adolescent aged 12-18 years at death, based on root apex closure of the loose dentition located with the Cranium B material. The adult cranial material with Cranium C most likely belongs with Cranium B. Approximately 15.0% of the cranium is present. Surface preservation of the cranial bones is good to moderate with only minimal taphonomic damage to the surfaces. No pathologies were observed.

Cranium D (B249) is a probable female aged 18-22 years at death. Surface preservation of the cranial bones is predominately moderate: chalky with some eroded areas. The cranial material is highly fragmentary and only approximately 35.0% is present. There were three maxillary left teeth examined, the first and second molars along with the second premolar which is within the maxilla. There were no pathologies observed on any of the teeth or bones.

Cranium E (B302) is an adult female tentatively aged 18-24 years at death. Surface preservation of the skeletal material is fairly good: chalky surface and minimal erosion. The cranium is approximately 25.0% complete with one large fragment consisting of an articulated frontal, right and left parietals but the rest of the cranium is very fragmentary. The sutures are almost completely obliterated with only traces of the sagittal suture still visible ectocranially. There were two maxillary right teeth examined, the first molar and second premolar, both are loose. There were no pathologies observed on the teeth or bones.

Tomb 159

Cranium A (B201) is an adult probable male. Age estimation was not possible. Surface preservation of the cranial bones is moderate: chalky with some eroded areas. However, the tooth is in very poor condition. Approximately 55.0% of the cranium was present and there is only one tooth recovered associated with this individual (the left maxillary second premolar). There were no pathologies observed.

Cranium B (B202) is an adult male most likely aged 25-35 years at death. Surface preservation of the cranial bones and mandible is moderate to poor: chalky with some erosion. The right side is fairly well preserved. Approximately 45.0% of the cranium is present plus the mandible. There were 16 maxillary, 14 mandibular teeth and two indeterminate roots examined, of which five mandibular teeth are in position. The mandibular third molars appear to be congenitally absent which may have affected the wear on the first molars. The first molars show heavier wear than the other teeth. Six anterior teeth, four maxillary and two mandibular, exhibit mild supragingival calculus flecks. Six anterior teeth do not display any calculus. The maxillary first molars show heavy attrition which has worn into the dentine. The mandibular first molars are heavily worn, but not to the same degree as the maxillary first molars. As well, a second cervical vertebra which was recovered with the cranium, displays osteoarthritic changes to the articular facet in the form of remodelling and extension. There is no evidence of trauma. There were no further pathologies observed.

Cranium C (B413) is a child aged six to ten years at death. Surface preservation of the cranial bones is poor: chalky and eroded. The bones are highly fragmentary. Almost half of the cranium could not be assessed for pathologies. Approximately 15.0% of the cranium is present, plus the mandible. There were 14 deciduous and 24 developing permanent teeth examined, of which four mandibular teeth are in position in a portion of the left mandible. There is some variation in the age estimation as the individual still retains a maxillary left deciduous central incisor and various other deciduous teeth which seem to indicate a younger age at death, possibly around seven years. This could be a result of retained deciduous teeth or early eruption of the permanent teeth. There is no evidence of dental disease and there were no pathologies observed on the bones.

Cranium D (B414) is most likely a child aged seven to eleven years at death. The cranium is very fragmentary and poorly preserved with only approximately 25.0% present. While no dentition was recovered with this cranium, the cranial vault thickness possibly indicates an older subadult. The tomb plans show that 'Teeth E' from the commingled bonestack material (B412) are located right next to Cranium D. Based on this and the general age estimation, it is likely that they are from the same individual, thereby providing an age estimation. Two deciduous maxillary, six developing permanent maxillary and four developing permanent mandibular teeth were examined from 'Teeth E'. There were no pathologies observed on the teeth or cranial bone.

Cranium E (B434) is most likely a subadult. The cranium is very fragmentary and poorly preserved, likely due to its position within the tomb against the northwest wall. Approximately 20.0% of the cranium is present. There was no dentition recovered with this cranium. However, based on general cranial vault thickness it most likely represents a subadult. There were only nine cranial bones associated with Cranium E, 80% of which could not be assessed for pathologies due to taphonomic damage. There were no pathologies observed on the bones.

Cranium F (B435) is a probable female adult, with no age estimation possible as there were no teeth recovered. This cranium is very fragmentary and in quite poor condition with the ectocranial table separated from the endocranial table and the diploë is missing in much of calvarium. It is approximately 40.0% complete. Overall, 78.6% of the cranial bones cannot be assessed for pathologies. There were no pathologies observed.

Cranium G (B436) most likely represents an adult with neither age estimation nor sex determination possible. The cranium is very fragmentary and in a very poor state of preservation with 35.0% of cranium present. The only tooth present is a loose mandibular right lateral incisor. There were no pathologies observed. However, it should be noted that due to taphonomic damage it was only possible to assess one element.

Cranium H (B437) is a female adult aged 22-26 years at death. Surface preservation of the cranial bone is predominately moderate: chalky with some eroded areas. However, most of the teeth are in poor condition. Approximately 40.0% of the cranium is present, though highly fragmentary. There were three right and two left maxillary teeth examined, of which the right first molar is in position. Almost half of the cranium could not be assessed for pathologies and there were no pathologies observed on the rest of the material.

Cranium I (B438) is a probable female adult with no age estimation possible. Surface preservation of the cranial bones is poor: chalky and eroded. It is highly fragmentary with only approximately 10.0% present of which 75.0% could not be assessed for pathologies. There is an intrusive deciduous right central mandibular incisor which most likely comes from Cranium E which was located directly above Cranium I in the bonestack. Both lateral maxillary incisors represent the only teeth which were examined for Cranium I. The left lateral incisor exhibits very heavy attrition, which is not reflected on the right lateral incisor. There were no conclusive pathologies observed.

Tomb 160

Skeleton E (B199) is a male aged 18-24 years at death. Surface preservation of the skeletal material is fair: chalky with some eroded areas on some bones. Overall, 3.0% of the skeletal material cannot be assessed for pathologies. Approximately 75.0% of the skeleton is present, including about 60.0% of the cranium. While the bones of the upper body (i.e. arm long bones, hands, wrists, shoulder, ribs, cervical and thoracic vertebrae) are well represented, most of the leg long bones and almost all the foot/ankle bones are missing. Several hand/wrist bones are not present, along with all the lumbar vertebrae and most of the pelvic girdle. There were nine maxillary and 16 mandibular teeth examined, of which six maxillary and eight mandibular teeth are in position. The only pathological lesions expressed on this individual are medium sized dental caries on the right maxillary first and third molars.

Cranium A (B194) is a female with an approximate age estimation of 22-28 years at death. Surface preservation is moderate to fair: chalky with some eroded areas. However, the teeth are in very poor condition. Approximately 40.0% of the cranium is present. There were eight maxillary teeth examined, of which two right teeth are in position. A second right maxillary premolar displays heavy attrition with wear into the lingual root. However, as the mandible has not been recovered in association with this cranium, there is no way to assess occlusion. There were no pathologies observed.

Cranium B (B195) is a probable female adult aged 22-26 years at death. Surface preservation is moderate: chalky with some eroded areas. However, the bones are highly fragmentary. Approximately 20.0% of the cranium is present. There were four maxillary posterior right teeth examined in position and one indeterminate tooth root. Surface preservation of the teeth is quite poor. There is a carious lesion in the buccal aspect of the right third maxillary molar. There is no further evidence of dental disease and no other pathologies were observed.

Cranium C (B196) is a child aged eight to twelve years at death. Surface preservation of the skeletal material is predominately moderate: chalky with eroded areas. However, the bones are highly fragmentary. Approximately 45.0% of the cranium is present. The three teeth recovered are loose, left maxillary developing permanent teeth. There were no pathologies observed.

Cranium D (B197) is a subadult with no age estimation possible as there were no teeth recovered. Surface preservation of the skeletal material is moderate: chalky with some eroded areas. Approximately 5.0% of the cranium is present in the form of calvarial fragments and a portion of the frontal bone. Based on the calvarial thickness, this likely represents a young individual. There were no pathologies observed.

Tomb 161

Skeleton A (B171) is a probable male aged 22-36 years at death. Surface preservation is fair to moderate, predominately described as chalky with some eroded areas. Overall, 5.4% of the skeletal material cannot be assessed for pathologies. Approximately 80.0% of the skeleton is present, including 60.0% of the cranium. Most body parts are represented to some degree bilaterally. The thoracic and cervical vertebrae and bones of the pelvic girdle are highly fragmentary and almost all the bones of the hands/wrist and feet/ankles are missing. There were 15 maxillary and 12 mandibular teeth examined, of which three teeth each remain in the maxilla and mandible. There is no evidence of dental disease. There are five lumbar vertebrae which exhibit osteophytic growth on the anterior aspect of the body, which is most likely due to labour-related actions and may have resulted in some mild back stiffness. Neither the cervical nor thoracic vertebrae groups were recovered with enough completeness to identify if the osteoarthritic changes affecting the lumbar vertebrae occurred further up the spine. There is no further evidence of osteoarthritic changes.

Cranium B (B173) is an adult of indeterminate age and sex. Surface preservation of the cranial bone is moderate: chalky with some eroded areas. Only six bones were observed as the cranium is highly fragmentary. Approximately 40.0% of the cranium is present, all from the calvarium. There were no teeth recovered. There were no pathologies observed.

Cranium C (B174) is an adult of indeterminate age and sex. Surface preservation of the cranial bones is moderate: chalky with some eroded areas. However, the bones are highly fragmentary. The cranium is approximately 70.0% complete. There were no teeth recovered. The calvarium is rather thick and robust. This may reflect a male individual or as there is mild cribra orbitalia observed in the left orbit of the frontal, the general thickness may be symptomatic of an infectious disease, metabolic disorder or hematopoietic disease. Post-mortem damage makes it impossible to assess the extent of the porosity in the orbit. There were no further pathologies observed.

Tomb 165

Skeleton E (B374) is a female aged 18-24 years at death. Surface preservation of the skeletal material is moderate to poor, predominately described as chalky with some eroded areas. Overall, 10.0% (n=8) of the skeletal material could not be assessed for pathologies. Approximately 75% of the skeleton is present, including about 80.0% of a skull which was removed *en bloc* and excavated in the lab. Most body parts are represented bilaterally to some degree, with the exception of the feet and ankle bones and thoracic and lumbar vertebrae which are completely absent. The left lower leg long bones, all vertebral groups, and bones of the pelvic girdle are very fragmentary and only minimally preserved. There are only a few hand/wrist bones present. There were 16 maxillary and 15 mandibular teeth examined, of which all but five are in position. The left maxillary central incisor displays a mild supragingival line of calculus on the labial aspect. This was not observed on any of the other teeth. There is no further evidence of dental disease. The left hamate and capitate are both remodelled, appearing misshapen, which may have affected the movement of the left wrist. The hamate and capitate articulate with each other and the lunate, scaphoid and triquetral were not recovered. The third through fifth metacarpals do not show any pathological changes. Given that the carpals work rather independently of each other to allow for different motions of the wrist, perhaps these bones are modelled by the ligaments attaching to them. There were no further pathologies observed on the bones.

Skeleton F (B400) is a female aged 34-42 years at death. Surface preservation is moderate to poor, described as chalky with some eroded areas. Overall, 11.1% of the skeletal material cannot be assessed for pathologies. Skeleton F is approximately 75.0% complete including roughly 75.0% of the cranium which was excavated *en bloc*. Most body parts are represented bilaterally to some degree, with the exception of the lumbar vertebrae which are absent. There are only very few highly fragmentary hand/wrist bones, a minimal amount of the pelvic girdle and only a few ribs present. Most of the foot phalanges are missing. There were 14 maxillary and 16 mandibular teeth examined, of which five maxillary teeth are in position and all but one of the mandibular teeth are in position. The maxillary left canine, lateral and central incisors display mild supragingival lines of calculus and the maxillary right second and third molars and left second premolar display carious lesions. The left maxillary second and third molars are not present and the occluding right mandibular third molar displays relatively heavy wear. The dental caries on the maxillary right second and third molars are particularly large and severe. There is no further evidence of dental disease. A single proximal foot phalanx displays osteophytic growth on the proximal epiphysis. None of the other three foot phalanges recovered display any pathologies. There is no evidence of trauma.

Cranium A (B146) is a probable female adult aged 24-30 years at death. Surface preservation of the cranial material is moderate, described as chalky with some eroded areas. Overall, 26.3% (n=5) of the cranium cannot be assessed for pathologies. Approximately 60.0% of the cranium is present, though rather fragmentary. There were three right maxillary teeth in position, a loose left maxillary second molar and an unidentified tooth root examined. Cranium A lost the right maxillary second molar *in* *vivo* and the alveolar bone is completely resorbed indicating that the tooth was lost some time before death. As well, a small caries was observed on the occlusal aspect of the left second maxillary molar. There are no mandibular teeth and no way to assess for bilateral expression. There is porosity observed in the superior aspect of the orbits of the frontal bone, representing possible cribra orbitalia. This could reflect reaction to a possible infectious disease, metabolic disorder or hematopoietic disease. There is no further evidence of any specific disease. There were no further pathologies observed.

Cranium B (B152) is a probable male adult with an estimated age at death of 28-34 years. Surface preservation of the cranial material is moderate: chalky with some eroded areas. Approximately 65.0% of the cranium is present, however it is rather fragmentary. A maxillary right central incisor, left second molar and unidentified tooth root fragment were examined. Particularly heavy attrition is observed on the maxillary right central incisor. However, there is no way to observe the occluding incisor. There were no pathologies observed. Os coxae fragments (B238) and a mandible (B238 CC) which were recovered with the bonestack corroborate this age and sex assessment for an individual within Tomb 165.

Cranium C (B205) is a probable female adult. No age estimation was possible for this individual. Surface preservation of the cranial material is moderate: chalky with some eroded areas. Approximately 70.0% of the cranium is present, though quite fragmentary. There were three right maxillary teeth examined, the first and second molars and the canine. There were no pathologies observed on either the bones or the teeth. The maxillary right canine shows heavy attrition, worn down into the dentine with secondary dentine formed.

Cranium D (B239) is a probable female with an estimated age of 42-52 years at death. However, this age may be artificially high due to ante-mortem tooth loss which would have affected wear from mastication. Surface preservation of the cranial material is moderate: chalky with some eroded areas. Approximately 55.0% of the cranium is present, including the maxillary third molars and the left second molar. In general appearance, the cranial vault is quite thick, up to 8mm at some points of the parietal with a compacted diplotic layer. This may reflect either a general robusticity or be a result of an infectious disease, metabolic disorder or hematopoietic disease. Another interesting change in the morphology of this cranium is a thumb-sized (approximately 10x10mm) depression in the calvarium at the junction of the coronal and sagittal sutures. There is no bone growth or indication of fracture at this point. It could possibly reflect an unintentional cranial modification or perhaps a long healed traumatic incident. A radiograph would possibly help to clarify this. In regards to pathologies, Cranium D lost the left maxillary first molar *in vivo* for which the alveoli is totally resorbed as well as the right first and second molars for which the alveoli was actively resorbing at death. Additionally, the maxillary left third molar exhibits a moderate supragingival ridge of calculus. There is no further evidence of dental pathology.

Cranium G (B444) is a subadult infant with an estimated age of six months to a year old at death. Preservation of this cranium was extremely poor. It was concreted and removed *en bloc* to be excavated in the laboratory but was exceptionally fragile and difficult to assess based on poor surface preservation. Approximately 10.0% of the cranium is present, including three developing deciduous mandibular teeth, the left first molar, canine and lateral incisor. Six postcranial bones were associated with the cranium, most of which likely belong to this individual as this is the only infant within the tomb. There were no pathologies observed on any of the material. However, only 16.7% could be assessed for pathologies.

Tomb 168

Cranium A (B210) is a probable female aged 12-20 years at death. Surface preservation of the cranial material is fairly good with minimal taphonomic damage. The cranium is very fragmentary and only about 35.0% complete. There were two left and four right maxillary teeth examined, all of which are loose. There were no pathologies observed on any of the cranial material examined.

Cranium B (B211) is a probable male adult aged 28-40 years at death. Surface preservation of the cranial material is fairly good with minimal taphonomic damage. The cranium is very fragmentary and only about 45.0% complete. Five left and seven right maxillary teeth were examined, of which eight are in position. There were no pathologies observed on any of the cranial material.

Cranium C (B212) is an adult. There is no age estimation or sex determination possible. The surface preservation is very poor. The cranium is highly fragmentary and approximately 10.0% complete. Only four cranial elements are associated with this individual including an occipital fragment, indeterminate cranial fragments and a left maxillary canine and second premolar. Both teeth were recovered with Cranium B, but due to the close proximity of the two crania it seems plausible that they belong to Cranium C, as both teeth are in position for Cranium B. No pathologies were observed.

Tomb 186

Skeleton A (B275) is an adult or adolescent with no age estimation or sex determination possible. Surface preservation of the skeletal remains is described predominately as chalky with some eroded areas. Approximately 40.0% of the skeleton is present, notably there were no cranial bones or teeth recovered with this context. All of the long bones are highly fragmentary and there are two extra unsided fibulae included with this context. There are almost no femora or small bones of the hands and wrists or feet and ankles present and the pelvic girdle and spine are only modestly represented. Overall, 26.2% of the skeletal material could not be assessed for pathologies. Several of the bones are quite gracile and there is an unfused proximal epiphysis of a tibia which would reflect an individual under 16 years of age at death, however the rest of the skeletal material does not reflect this young an age. It is possible that perhaps this represents another individual, but given that there is no further indication of a third individual (with Skeleton B representing an adult) it seems unlikely that a third younger individual was present. There were no pathologies observed.

Skeleton B (B274, B308) is an adult with no age estimation or sex determination possible. Surface preservation of the skeletal material is fair to moderate with most bones described as chalky with eroded areas. Overall, 31.3% of the skeletal material could not be assessed for pathologies. Approximately 40.0% of the skeleton is present, including only 5.0% of the cranium. There are two extra femora included with this context which most likely are associated with Skeleton A. Several other long bones are missing, as are many of the hand and wrist and foot and ankle bones, vertebrae, pelvic girdle, shoulder girdle and ribs. Only three teeth were recovered with this individual, none of which could be assessed for an age estimation. The distal epiphysis of a right second metatarsal is unfused. This is an adult sized bone so it is either a developmental defect or perhaps associated with an adolescent. There were no pathologies observed.

Tomb 189

Skeleton A (B281, B283) is a probable female adult aged 18-24 years at death. Surface preservation of the skeletal material is fair to moderate: predominately chalky with some eroded areas. Overall, 3.9% of the skeletal material could not be assessed for pathologies. Approximately 50.0% of the skeleton is present, including about 40.0% of the cranium. The entire lower half of the body is missing, with only a few fragments of leg long bone recovered. There are no lumbar vertebrae or pelvic bones present. The arm long bones are all present as are many of the hand phalanges. There were eight maxillary and 18 mandibular teeth examined, of which two maxillary and ten mandibular teeth are in position within their respective jaws. Osteoarthritic changes were observed on the second cervical vertebra, with an osteophyte projecting from the superior aspect of the dens and on the bodies of the other cervical vertebrae, which were recovered *en bloc*. The cervical vertebrae bodies appear remodelled and compressed. The fragmentary first cervical vertebra and thoracic vertebrae do not display any pathology and the lumbar vertebrae are not present. There is no evidence of trauma. Two teeth display dental pathologies. The right maxillary second molar has a carious lesion on the occlusal aspect and the mandibular left canine has mild supragingival flecks of calculus on the labial surface. There was no further evidence of dental disease and no other pathologies were observed on the bones.

Skeleton B (B282, B300) is a probable female aged 20-24 years at death. Surface preservation is fair, predominately described as chalky. Overall, 15.5% of the skeletal material could not be assessed for pathologies. Approximately 45.0% of the skeleton is present, including about 50.0% of the cranium. There are extra humeri and ulnae present within this context, but all of the lower half of the skeleton is missing, with the exception of the left patella, right first metatarsal and a few os coxa fragments. Most of the hand and wrist bones are missing, as are most of the cervical vertebrae. The thoracic vertebrae are fairly well represented. There were 14 maxillary and nine mandibular teeth examined, of which four maxillary and four mandibular teeth are in position. The maxillary central incisors and right first premolar all display mild to moderate supragingival calculus and a right mandibular third molar exhibits a LEH near the cemento-enamel junction. There is no further evidence of dental disease and the left mandibular third molar does not display a defect. A fourth metacarpal and a left rib head both exhibit osteophytic growth on the margins of the articular surface reflecting osteoarthritic changes to at least one hand and one rib. None of the other four metacarpals present display any pathologies and the while the ribs are highly fragmentary, none of them are recorded with pathology, nor are any of the thoracic vertebrae. It is not possible to assess for evidence of trauma. There were no other pathologies observed on the skeleton.

Cranium C (B345) is a female with no age estimation possible. Surface preservation of the cranial material is moderate: chalky with some eroded areas. Some of the bones are rather thick and robust, but the traits are still female. Approximately 15.0% of the cranium is present. There are no teeth present. No pathologies were observed.

Cranium D (B355) is a probable female adult aged 18-22 years at death. Surface preservation of the skeletal material is predominately moderate: chalky with some eroded areas. Approximately 65.0% of the cranium is present. There were 11 maxillary and six mandibular teeth examined, of which six maxillary teeth and one mandibular tooth are in position. The mandible associated with this cranium show ante-mortem tooth loss of the left first molar. The alveolar bone is totally resorbed and the condyle shows some possible mild porosity. The left first maxillary molar is loose and exhibits a large carious lesion from the occlusal surface well into the roots of the tooth which may have led to an infection. The mandibular left first molar is not present. There is no further evidence of dental disease. The frontal bone of the cranium displays porosity or cribra orbitalia on the superior aspect of the right orbit. This porosity could have a number of causes including, an infectious, metabolic or hematopoietic disease or disorder. There is no evidence of porosity on any other cranial bone. The calvarial fragments are quite thin and there isn't much diploë present. There were no further pathologies observed.

Tomb 190

Cranium A (B270) is a probable female adult aged 18-26 years at death. Surface preservation of the skeletal material is poor: chalky and eroded. Overall, 82.8% of the skeletal material could not be assessed for pathologies. Approximately 35.0% of the cranium is present, along with mandible fragments, a left clavicle and a couple of indeterminate long bones. There were seven maxillary and two mandibular teeth examined, all of which are loose. There are two duplicate teeth which are labelled as 'Individual A', which likely do not belong to Cranium A as these teeth are already present. There is no evidence of dental disease and there were no pathologies observed on the bones.

Cranium B (B271) is a probable child aged seven to thirteen years at death. This estimation is tentative as only minimal cranial fragments were recovered and all the teeth are loose and mixed with cranial and postcranial bones. Surface preservation for the material within this context is very poor, as the majority of the material is highly fragmentary with very poor surface preservation. The cranium is approximately 5.0% complete composed entirely of unidentified calvarial fragments. There were 20 teeth examined representing at least two individuals. At least seven teeth are associated with Cranium B. There were no pathologies observed.

Tomb 192

Skeleton A (B261, B262, B263) is a probable female aged 22-38 years at death, based on cranial features and dental wear. Surface preservation of the skeletal material is moderate to poor, predominately described as chalky with some eroded areas. There are at least three adult individuals represented within this context. The second adult individual is represented by a number of postcranial bones, particularly carpals, metacarpals and arm long bones, as well as at least a right maxillary third molar, canine, lateral and central incisors and a right mandibular third molar, reflecting a young adult. The third adult is represented by a left radius and a maxillary right central incisor. There are also intrusive remains of an infant aged one to three years within this context. Skeleton A is approximately 75.0% complete, including about 20.0% of the cranium which is highly fragmentary. While the small bones of the hands/wrists are well represented, the leg long bone are mostly absent as are the majority of the foot and ankle bones. The cervical and thoracic vertebrae are well represented, however the lumbar vertebrae and the left os coxa are mostly absent. There were ten maxillary and 11 mandibular teeth examined, all of which are loose. As there is some mixing of skeletal elements within this context, this represents the most likely interpretation of the remains belonging to Skeleton A.

Osteoarthritic changes represent the highest proportion of pathologies affecting the bones associated with Skeleton A. The hands, wrists and vertebrae are predominately affected. At least two individuals within this context exhibit degenerative joint disease of the wrist and elbow as two left capitates and two left radii are affected. At least one individual displays bony growth of the cervical, thoracic and lumbar vertebrae with all three vertebral groups exhibiting osteophytic growth or extension of the articular facets and/or anterior aspect of the body. This includes the atlas which displays a small bony ridge in the middle of the superior aspect of the right facet which may reflect a poor articulation with the occipital condyles of the cranium, neither of which is present. The left scaphoid, lunate, trapezium and two left capitates, as well as a right lunate all exhibit extension of the articular facets and variations in morphology which reflect remodelling of the bones. One of the left radii has osteophytes projecting distally from the inferior aspect of the radial head, while the other one has bone growth along the posterior margin of the radial tuberosity and osteophytes projecting distally from the inferior aspect of the radial head on the posterior aspect. This is not bilaterally expressed as the right radius does not display any evidence of pathology. However, a right ulna shows bone growth just inferior to the radial notch and extension of the radial notch, which is not observed on any of the left ulnae. A right and a left fourth metacarpal each display bone growth and extension of the lateral facets at the proximal epiphysis. The medial facet of the left patella is remodelled with bone growth along the margins of the facet. This is the only patella recovered with this context. None of these bones discussed above display evidence of trauma. The distal epiphysis of an intermediate hand phalanx displays osteophytic growth which may represent the broken remains of a distal phalanx which was fused to the intermediate phalanx. Trauma is conclusively observed between a proximal and intermediate phalanx which are fused to form a Boutonniere deformity. The only other pathology affecting the hand phalanges is discussed above, however as the left and right fourth metacarpals are both affected there are bilateral osteoarthritic changes to the hands.

Calculus represents the highest proportion of dental disease within this context with ten adult teeth displaying mild to moderate supragingival lines or flecks. There is no duplication of teeth with calculus so it seems plausible that these teeth belong to the same individual, most likely Skeleton A. Two maxillary teeth each display a carious lesion, the left second and right third molars. The right third maxillary molar also displays a LEH in the cervical third of the crown, as does a right maxillary canine which also has a moderate supragingival line of calculus. It is uncertain, though possible that all these teeth belong to Skeleton A. If this is the case, Skeleton A suffered from various dental pathologies. Neither the maxillae nor mandible were recovered to assess for evidence of periodontal disease or ante-mortem tooth loss. A maxillary left first molar, possibly associated with Skeleton A displays severe attrition which has worn away almost all of the crown.

Cranium B (B292) is a probable male aged 22-28 years at death. Surface preservation is good to moderate, mainly described as chalky, though highly fragmentary. The cranium is approximately 60.0% complete. There were 11 maxillary teeth and one indeterminate tooth examined, five of which are in position, though three are missing their crowns. The maxillary right first and second molars and the left maxillary canine each display a mild supragingival ridge of calculus. There is no further evidence of dental disease and there were no pathologies observed on the bones.

Cranium C (B293) is a probable female aged 22-28 years at death. Surface preservation is fair to poor, as much of the bone is described as chalky with some eroded areas. The cranium is approximately 55.0% complete. There were 14 maxillary teeth examined, with only the right canine and right central incisor not recovered and an indeterminate tooth root. Eight of the teeth are in position. Five teeth display mild supragingival calculus and the right first molar exhibits a small carious lesion. The evidence of dental disease is sustained by evidence of alveolar resorption of the maxillae observed between the molars. The left maxilla also displays porous bone and some remodelling in the sinus cavity. This possibly reflects a chronic infection. However, post-mortem damage makes the extent difficult to assess. The mandible was not recovered, nor was the right sinus cavity. There is no further evidence of pathology on the bones or teeth. The frontal bone has retained the metopic suture.

Cranium D (B332) is a child aged two to four years at death. Surface preservation is fairly poor, predominately described as chalky with some eroded areas. Approximately 65.0% of the cranium is present, including four deciduous and six developing permanent maxillary teeth and an indeterminate tooth root. Four of the teeth are in position. There is no evidence of dental disease. There were no pathologies observed on the cranial bone.

Cranium E (B313) is a female aged 20-28 years at death. Surface preservation of the skeletal material is fairly good, described as having a chalky surface. The cranium is fairly well preserved with approximately 60.0% present, including the mandible. There were eight maxillary and nine mandibular teeth examined, of which six maxillary and six mandibular teeth are in position. Additionally, there is one unidentified tooth. Five maxillary teeth and one mandibular tooth display mild supragingival calculus and maxillary right second molar also displays a carious lesion. The right maxillary first molar is heavily worn. There is no further evidence of dental disease and there were no pathologies observed on the bones.

Cranium F (B314) is a female aged 18-26 years at death. Surface preservation of the skeletal material is quite good, predominately described as chalky. Approximately 60.0% of the cranium is present. There were 11 maxillary teeth and one mandibular tooth examined, of which five maxillary teeth are in position. The right maxillary second premolar displays a mild supragingival ridge of calculus. There is no further evidence of dental disease and there were no pathologies observed on the cranial bones.

Cranium G (B315) is a female aged 28-42 years at death. Surface preservation is fair to poor, described as chalky or chalky with eroded areas. Approximately 20.0% of the cranium is present, including two teeth: the right mandibular second and third molars. Age estimation for this individual is difficult as the teeth present are a very unusual morphology with roots of both teeth being very short and small and a very different preservation from the rest of the cranial material. As well both teeth have semi-fused or joined roots. There is no evidence of dental disease and there were no pathologies observed on the bones.

<u>Tomb 193</u>

Skeleton E (B304, B305, B306) is an older adolescent probable female with a tentative age of 16-20 years at death. However, this is based on a single tooth and the fused sternal end of the clavicle associated with the individual indicates an older individual. Surface preservation of the skeletal material is predominately moderate to poor: chalky with some eroded areas. Overall, 18.7% of the skeletal material could not be assessed for pathologies. Approximately 70.0% of the skeleton is present, including about 35% of the cranium. Most of the long bones are represented with the exception of left tibia, while most of the small bones of the hands and wrists and feet and ankles are missing. There are no lumbar vertebrae and the bones of the pelvic girdle are only minimally represented. There were four maxillary and 12 mandibular teeth examined, of which three maxillary and ten mandibular teeth are in position. Skeleton E displays evidence of dental disease in the form of ante-mortem tooth loss of the left second maxillary premolar missing with the bone totally resorbed, a caries in the right first mandibular molar and a LEH on both mandibular canines. Neither of the maxillary canines are present. The distal epiphysis of an indeterminate metacarpal and the sternal end of a right clavicle display osteophytic growth around the articular surfaces which represents mild osteoarthritic changes. There is no evidence of trauma. The sternal epiphysis of the left clavicle is not present and the other three metacarpals present do not display any pathological changes. There is no further evidence of pathology on the bones or teeth.

Cranium B (B278) is very tentatively an adult female with no more precise age estimation possible. Surface preservation of the cranial material is fairly good with all elements described as chalky and only one element could not be assessed. The cranium is highly fragmentary and approximately 30.0% of the cranium remains. There were no teeth recovered with this individual. There were no pathologies observed on the bones.

Cranium C (B279) is very tentatively assessed as an adolescent female aged 16-20 years at death. Surface preservation is moderate to poor, making identification difficult. Only approximately 20.0% of the cranium is present. The maxillary left first and second molars were examined. Some of the sutures look relatively open. There were no pathologies observed on the bones or teeth.

Cranium D (B290) is tentatively an adult female aged 18-24 years at death. Surface preservation is fair with the majority of the bones described as chalky. The cranium is very fragmentary and only about 45.0% is present. There were two maxillary and three mandibular teeth examined, all of which are loose. The mandibular right first molar displays two mild LEH on the crown in the cervical and middle thirds. The mandibular left first molar is not present and none of the other teeth display any evidence of pathology. There were no pathologies observed on the cranial bone.

Tomb 195

Skeleton A (B267, B296) is a probable male aged 30-38 years at death. Surface preservation is quite variable from fairly good to quite poor conditions. Approximately 50.0% of the skeleton is present, including about 20.0% of the cranium. The long bones are all highly fragmentary and the tibiae are missing, as are most of the small bones of the hands and wrists and feet and ankles. Only a minimal amount of vertebrae were recovered, with no lumbar vertebrae. There were six maxillary and 16 mandibular teeth examined, of which three maxillary and ten mandibular teeth are in position. There were no pathologies observed for this individual.

Tomb 200

Skeleton C (B458) is a probable male aged 21-46 years at death based on dental wear and the os coxa, though more likely at the younger end of the range between 20-30 years. Surface preservation of the skeletal material is predominately good, described as having a chalky surface and the teeth are in excellent condition. Approximately 85.0% of the skeleton is present, including about 80.0% of the cranium plus the mandible. Most body parts are represented bilaterally to some degree. The only long bones missing are the tibiae and there are only a few tarsals and carpals recovered, with the right foot missing completely. While the pelvic girdle is fragmentary, it is present. All vertebral groups are fairly well represented. There were nine maxillary and 12 mandibular teeth examined, of which only four maxillary teeth and one mandibular tooth are loose. There is indication of fairly severe dental disease affecting this individual. While the maxillae were not preserved very well, the mandible is in very good condition and displays ante-mortem tooth loss of the left first molar and the right first and second molars. The alveoli are completely resorbed and the bone has receded with a fine ridge of bone in the place of the lost teeth. The left first molar appears to have been lost either perimortem or post-mortem. Mild supragingival calculus was observed on the maxillary lateral incisors and right canine as well as the mandibular central and lateral incisors, the right canine and right first premolar. Both mandibular second premolars display small caries on the distal aspect of the tooth at the cemento-enamel junction. The right mandibular first premolar and third molar also both display carious lesions in the occlusal aspect of the crown. Severe attrition is recorded on the mandibular left first premolar and left canine.

The pathologies affecting the postcranial bones of Skeleton C reflect degenerative joint disease. The fifth through seventh cervical vertebrae are fused together at the articular facets and the fourth through eighth thoracic vertebrae display porosity and extension of the articular facets. As well, two thoracic vertebrae body fragments display osteophytic growth of the anterior margin and four lumbar vertebrae exhibit severe osteophytic growth on the anterior margins of the body. The articular facets of several ribs (five left and five right) display remodelling with furrows. As there is no evidence of trauma of the vertebrae, the fusion of the cervical vertebrae may represent the early stages of ankylosing spondylitis (AS), or at the very least degenerative joint disease. Other postcranial bones are affected with osteoarthritic changes, include: the capitulum of the right humerus and the tuberosity of the right radius, both which display bone growth which seem to reflect a poor articulation at the elbow. The left elbow is not similarly affected, as neither the humerus, radius nor ulna exhibit any changes. There is no evidence of trauma. Both left and right first metacarpals display osteophytic growth of the proximal epiphysis as does the left first proximal hand phalanx. However, the right first proximal phalanx does not. The only hand bone which displays evidence of trauma affecting the articular surface, is the left first metacarpal which also appears slightly twisted at the diaphysis. The left first metatarsal displays a small bony growth on the dorsal aspect which may reflect a poor articulation with the left first proximal epiphysis, as it displays extensive osteophytic growth of the proximal epiphysis. The right metatarsals and foot phalanges are not present. The sacrum is in very poor condition, but it appears that the second and third sacral vertebrae were not fused. The second and third sacral vertebrae typically fuse between 18-24 years and are 80.0% fused by 22 years. The first sacral vertebra is missing, but the third and fourth vertebrae have fused. Clinical studies show that a transitional sacral vertebra is found in conjunction with osteoarthritic changes to the vertebrae (Aihara *et al.* 2005; Kanchan *et al.* 2009). This may reflect a congenital developmental defect or a retardation of development depending on where this individual falls in the estimated age range based on the os coxae and dental wear.

Skeleton D (B459) is a probable female adult aged 32-42 years at death. Surface preservation is fairly good with the majority of the material described as chalky and the teeth are in an excellent state of preservation. Approximately 45.0% of the skeleton is present, including about 90.0% of the cranium plus the mandible. The lower half of the body is mostly absent, with only fragments of the pelvic girdle, a partial right femur and one intermediate foot phalanx recovered. Most of the hand/wrist bones are missing. However, the long bones of the arms, the thorax and the vertebrae are fairly well represented. There were 13 maxillary and 15 mandibular teeth examined, of which all but four maxillary teeth are in position. Quite severe dental disease affects Skeleton D. Both the maxillae and mandible are very well preserved. The left and right first maxillary molars and the left second premolar were lost *in vivo*. While the bone has healed well, there is still evidence of porosity at the site of tooth loss. All of the anterior mandibular teeth, including the first premolars, the left second premolar and the left first molar display mild to severe supragingival calculus on the lingual surface of the tooth predominately and maxillary lateral incisors, canines and left first premolar display mild supragingival calculus lines on the labial surface. Caries were observed on four teeth: the mandibular right second premolar, both mandibular second molars and the left maxillary second molar. Heavy attrition is recorded for the maxillary left second molar and left central incisor.

In regards to postcranial pathologies, three cervical and three thoracic vertebrae display mild osteophytic growth on the anterior aspect of the bodies. There is no evidence of pathology on the atlas or axis, nor on the recovered fragments of lumbar vertebrae. Finally, Skeleton D has a healed distal radial fracture (possibly a Colles fracture) of the right radius, most likely caused by a fall forwards where the arm was outstretched to stop the fall. The fracture has healed remarkably well with only a minor bony callous on the distal end of the radius. The bone is one centimetre shorter than its left counterpart, which displays no evidence of pathology. Neither the proximal end of the right ulna nor the distal epiphysis of the right humerus display any pathological change or poor articulation and the right scaphoid is quite fragmented and the right lunate is not present.

Cranium A (B419) is an adult male with no more precise age estimation possible. Surface preservation of the cranial material is predominately moderate: chalky with some eroded areas. Approximately 50.0% of the cranium is present, including a large wormian bone and two auditory ossicles. Only an in position left maxillary first premolar was examined. The left maxillary lateral incisor, first and second molars were all lost *in vivo* and the left maxillary first premolar is discoloured from decay, though damaged post-mortem. The alveolar bone at the site of the lateral incisor and the first molar is totally resorbed, but it is actively resorbing with porosity where the second molar was located. There were no pathologies observed on the bones.

Cranium B (B457) is an adult male with no age estimation possible. Surface preservation of the cranial material is predominately moderate: chalky with some eroded areas. Approximately 65.0% of the cranium is present with some sutures still visible. There were no teeth recovered. There were no pathologies observed.

Tomb 201

Skeleton A (B433) is a female adult aged 28-34 years at death. Surface preservation of the skeletal material is predominately quite poor: chalky and eroded. A quarter (n=22) of the skeletal material could not be assessed for pathologies. Approximately 75.0% of the skeleton is present, including about 25.0% of the cranium. Most body parts are bilaterally represented to some degree, however most bones are highly fragmented. The pelvic girdle is fairly complete, while the metacarpals are mostly present though unidentifiable with only the diaphyses preserved. There are only three tarsals and very few foot phalanges present. One maxillary tooth and 11 mandibular teeth were examined, of which the maxillary tooth is in position with no crown due to post-mortem damage and six mandibular teeth are in position. Seven teeth cannot be assessed for pathologies due to post-mortem taphonomic damage. There is no evidence of dental disease.

Osteoarthritic changes are observed on several elements, though always unilaterally, either due to the absence of the opposing bone as with the calcaneus and first proximal foot phalange or because it is not observed on the recovered bone as on the left acetabulum and fourth metatarsal. There is no evidence of trauma on the affected bones. The acetabulum of the right os coxa shows osteophytic growth at the margins of the facet. The body of a vertebra displays osteophytic growth on the anterior margin. The plantar aspect of the right calcaneus is remodelled with a new bone growth on the plantar surface of the articular facet. The proximal epiphysis of the right fourth metatarsal is very smooth with osteophytic growth along the margin of the proximal articular facet. Both the proximal and distal epiphyses are affected of the right first proximal foot phalanx with osteophytic growth at both. Skeleton A displays quite severe evidence of trauma on the right radius. A mal-healed fracture in the middle of the diaphysis has an extensive bone callous, particularly on the lateral aspect, and a cloaca in the lateral aspect indicating an ongoing infection. There is no evidence of pathology on the distal epiphysis of the right humerus or ulna, though only about 50% of the diaphysis of the ulna is present. The left arm long bones do not display any pathological changes. However, they are distinctly more robust than the right arm bones.

Cranium B (B461) is a male adult aged 24-34 years at death. Surface preservation of the skeletal material is fairly poor: chalky with eroded areas. However, the teeth are in good condition. Approximately 35.0% of the cranium is present. The right maxillary canine to the third molar are in position and there is one loose unidentified tooth root. There is no evidence of dental disease. In general, the diploë is observed to be quite thick, making the overall cranium quite robust. There were no pathologies observed on the bones.

<u>Tomb 208</u>

See the tomb descriptions.

<u>Tomb 207</u>

Skeleton E (B353) is a probable female adult aged 22-30 years at death. Surface preservation of the skeletal material is predominately poor and described as chalky and eroded. Overall, 53.1% of the skeletal material could not be assessed for pathologies. Skeleton E is fairly incomplete with approximately 45.0% of the skeleton present, including about 25.0% of the cranium. While all of the long bones except the left humerus are present, they are very fragmentary and incomplete. The small bones of the hand and the pelvic girdle are partially represented. However, the carpals and small bones of the feet and ankles are missing entirely. There were ten maxillary and eight mandibular teeth examined, all of which are loose. There were no pathologies observed on the teeth or bones.

Skeleton F (B375) is a probable adolescent female aged 16-22 years at death. Surface preservation is very poor and described as chalky and eroded. Overall, 38.9% of the skeletal material could not be assessed for pathologies. Approximately 40.0% of the skeleton is remaining, including 45.0% of the cranium. All of the long bones are present, though very incomplete. There are only three metacarpals and two metatarsals present, all other hand and wrist and foot and ankle bones are missing post-mortem. Most of the vertebrae were not recovered, nor was the pelvic girdle. There were 14 maxillary and 15 mandibular teeth examined, of which six maxillary and nine mandibular teeth are in position. There were no pathologies observed on the bones or teeth.

Skeleton G (B376) is a probable female adult aged 22-36 years at death. Surface preservation of the skeletal tissue is very poor. Overall, 42.9% of the skeletal material could not be assessed for pathologies. Approximately 25.0% of the skeleton is present, including about 75.0% of the cranium. Only the humeri, radii, clavicles, scapulae, a left femur fragment and several vertebrae and rib fragments are present. There were four maxillary and 11 mandibular teeth examined, all of which are loose. The only pathology observed is a carious lesion on the distal aspect of the mandibular left canine. As well, the left and right mandibular molars display heavy attrition through the crown and into the root. There were no pathologies observed on the bones.

Cranium A (B285) is a probable female adult. No age estimation is possible. Surface preservation is moderate to poor: chalky with some eroded areas. Overall, 60.0% (n=6) of the cranial material could not be assessed for pathologies. Approximately 15.0% of the cranium is present. Only the maxillary right first and second molars are present. The right maxillary first molar displays heavy attrition into the tooth root through the crown with secondary dentine formed. There were no pathologies observed on the bones or teeth.

Cranium B (B286) is a probable female adult. No age estimation was possible. Surface preservation of the cranial material is poor: chalky and eroded. Approximately 60.0% of the cranium remains. There were two maxillary and three mandibular teeth examined, of which only the maxillary left first molar is in position. Left and right petrous temporal portions belonging to a subadult were also recovered with this context. There were no pathologies observed on the bones or teeth.

Cranium C (B287) is an adolescent individual aged 10-14 years at death. Surface preservation is moderate to poor with all the bone material described as chalky with some eroded areas. Overall, 18.8% of the cranial material could not be assessed for pathologies. Approximately 20.0% of the cranium is present. There were six loose maxillary teeth examined. There were no pathologies observed on the bones or teeth.

Cranium D (B312) is a probable female adult aged 18-22 years at death. Surface preservation is moderate to poor as it is described as chalky with some eroded areas. Overall, 46.7% of the cranial material could not be assessed for pathologies. Approximately 30.0% of the cranium is present. There were six loose maxillary teeth examined. There were no definite pathologies observed on the bones or teeth.

<u>Tomb 220</u>

Skeleton A (B389) is a probable female aged 24-28 years at death. The cranium associated with Skeleton A was catalogued with the material from Bonestack A (B390) and there seemed to be some confusion with mixed contexts, but there are at least two individuals between Bonestack A and Skeleton A and Skeleton A is considered here, independently of Bonestack A. Surface preservation of the skeletal material is fairly good, described as chalky. Overall, 10.5% of the skeletal material could not be assessed for pathologies. Approximately 80.0% of the skeleton is present, including 60.0% of the cranium plus the mandible. Most body parts are represented bilaterally to some degree. All long bones are present, though incomplete, as are all vertebral groups. Less than half of the bones of the hands and wrists and feet and ankles are recovered. Both os coxae are represented, though they are very incomplete and fragmentary. There were 13 maxillary teeth and one mandibular tooth examined, of which four maxillary teeth and the one mandibular tooth are in position. The right maxillary canine displays a mild LEH in the occlusal third of the crown, the left maxillary canine does not have any enamel remaining due to post-mortem damage. The right maxillary lateral incisor has a moderate supragingival calculus line on the labial aspect, the left lateral incisor has no enamel remaining due to post-mortem damage and the only anterior maxillary tooth with enamel, the right central incisor, does not display any pathology. The maxillary left third molar and canine both display heavy attrition through the crown and into the root. There is no further evidence of dental disease, though six of the teeth cannot be assessed for pathology. One bone displays osteoarthritic changes. The radial notch of the left ulna is extended towards the posterior and distally. There is no evidence of trauma and the right ulna is not similarly affected. The left radius and humerus do not display any pathological changes, though a size difference was noted, with the long bones of the left arm having a smaller diaphyseal diameter than those of the right arm. There were no further pathologies observed on the bones.

Cranium B (B406) is an adult female with no more precise age estimation possible, but there are no sutures visible. Preservation is quite poor with the majority of the material described as chalky with eroded areas. Approximately 35.0% of the cranium is present. The maxillary left canine is the only tooth recovered and has been worn through the crown and into the root.

Cranium C (B464) is a probable female adult with no age estimation possible. Surface preservation of the cranial material is moderate to poor: chalky with some eroded areas. Approximately 45.0% of the cranium remains. There were no teeth examined. There are two left and two right temporals as well as a second occipital, indicating a second adult individual. The only pathology is a dental abscess in the maxilla at the root apex of the left first molar. The infected tooth has been lost *in vivo* and the abscess is healing with porous bone growth within the cavity.

Cranium D (B391) is a probable female with no age estimation possible. Preservation for this context is quite poor: chalky with some eroded areas. Overall, 38.5% of the cranial material could not be assessed for pathologies. Approximately 20.0% of the cranium remains. Five maxillary right teeth were present in position, however all had lost their crowns post-mortem. It was not possible to assess dental pathologies. Similarly, there were no pathologies observed on the bones.

Cranium E (B405) is most likely an adolescent individual, based roughly on the state of suture closure and the thinness of the cranial vault. Surface preservation is moderate to poor. A quarter of the skeletal material could not be assessed for pathologies. Approximately 30.0% of the cranium remains, including one indeterminate tooth root. There were no pathologies observed.

Cranium F (B468) is a probable male aged 18-30 years at death. The maxillary teeth of Cranium F are in position and mandible BU from Bonestack B (B465), upon which the cranium was resting, articulates with the maxilla which suggests that they are the same individual. The mandible BU (B465) will be included with the discussion of Cranium F. Surface preservation is moderate to poor: chalky with some eroded areas. Approximately half of the cranium is present, plus the mandible. There were 13 maxillary and 13 mandibular teeth examined, all but three of the maxillary teeth are in position. The only evidence of dental disease occurs on the maxillary left first molar which displays a mild caries in the occlusal aspect and the maxillary right first molar which displays mild supragingival flecks of calculus. None of the other teeth display any dental disease. The left third mandibular molar is either congenitally absent or was lost some time before death. A radiograph of the mandible would aid in determining whether the third molar is absent or lost. There were no pathologies observed on the cranial bones.

Tomb 221

Skeleton A (B370) is very tentatively a female aged 24-28 years at death, based on the assessment of one molar. Preservation of the skeletal material is very poor, highly fragmentary with chalky and some eroded surfaces. Overall, 49.3% of the skeletal material could not be assessed for pathologies. Approximately 40.0% of the skeleton is present, including about 20.0% of the cranium. All of the long bones are represented bilaterally to some degree, though highly fragmentary. Most of the hand and wrist and feet and ankle bones were not recovered, nor were the majority of the os coxae and the ribs and the vertebrae. There were seven maxillary teeth, one mandibular and one indeterminate tooth examined, all of which are loose. There were no pathologies observed on the bones or teeth.

Tomb 228

Skeleton E (B388) is a probable female aged 22-28 years at death. Surface preservation of the skeletal material is predominately fair to moderate. Overall, 9.4% of the skeletal material could not be assessed for pathologies. Approximately 75.0% of the skeleton is present, including 20.0% of the cranium. All the long bones are represented bilaterally to some degree. Only half the small bones of the hands and feet and ankle are present, with the left side better represented than the right. The lumbar vertebrae are completely absent, while the cervical and thoracic vertebrae are present though fragmentary. There are almost no foot phalanges present. There were eight maxillary and ten mandibular teeth examined, of which three mandibular teeth are in position. The maxillary right second molar and second premolar and the mandibular second molars each display one or more carious lesion. The left and right first metacarpals both display evidence of a possible healed fracture. The diaphysis of the left one has a concavity in the diaphysis on the palmar aspect, while the right first metacarpal displays osteophytic growth of the proximal epiphysis because of a healed fracture which has slightly twisted the diaphysis. Neither first proximal hand phalanges are present, nor are the adjacent carpals. None of the other metacarpals exhibit any pathological changes. The distal epiphysis of an intermediate foot phalanx displays osteophytic projections. There was only one other foot phalanx recovered and it does not display any evidence of degenerative changes. There were no further pathologies observed.

Cranium B (B380) is an adult male with no age estimation possible. Preservation of the cranial material is moderate. Approximately 20.0% of the cranium is present. There were no teeth recovered. There were no pathologies observed on the bones.

Cranium D (B384) is an adult, represented by a left temporal fragment, an occipital fragment, a wormian bone and indeterminate cranial fragments. No sex or age assessments are possible. Surface preservation is fair to moderate with minimal material remaining. Less than 5.0% of the cranium is present. There were no pathologies observed.

Tomb 229

Skeleton B (B427) is an adult aged 22-28 years at death. Surface preservation is poor. Overall, 57.1% of the skeletal material could not be assessed for pathologies. Approximately 25.0% of the skeleton is present, including about 25.0% of the cranium. While both humeri are present, only one radius, one ulna, one scapula, one clavicle and one carpal were recovered. There are only fragmentary vertebrae, ribs and three hand bones present. None of the skeleton inferior to the thoracic vertebrae was recovered, barring a fragmentary femur. There were ten maxillary teeth and one mandibular tooth examined, all of which are loose and have very poor surface preservation. The only pathologies observed are carious lesions in the left second maxillary molar and right first maxillary molar. There were no pathologies observed on the bones.

Cranium A (B428) is a probable male adult with no more precise age estimation possible. Preservation of the cranial bone is poor, highly fragmented with moderate surface condition. Approximately 15.0% of the cranium is present, with no teeth recovered. No pathologies were observed.

Tomb 235

Cranium 1 (B407) is possibly a subadult, based on calvarial thickness. Surface preservation of the bones is moderate. Approximately 15.0% of the cranium remains, predominately indeterminate calvarium fragments and occipital fragments. No teeth are present. No pathologies were observed.

Cranium 2 (B408) is an adult. It was not possible to estimate age or assess sex. Surface preservation of the bones is moderate. Approximately 20.0% of the cranium remains, including several parietal, temporal and calvarial fragments. No teeth were recovered. No pathologies were observed.

Cranium 3 (B409) is possibly a subadult, based on cranial thickness. Surface preservation of the bones is poor. Approximately 20.0% of the cranium remains, including indeterminate calvarial and occipital fragments. No teeth were recovered. No pathologies were observed.

Cranium 4 (B410) is a subadult aged 11 years +/- 30 months at death, based on dental development. Surface preservation of the bones is moderate. Approximately 20.0% of the cranium remains, consisting of left parietal, occipital and calvarial fragments. A developing right mandibular second molar is the only tooth recovered. No pathologies were observed.

Cranium 5 (B411) is a probable male adult based on the occipital morphology, with obliterated sutures most likely indicating an older individual. Surface preservation of the bones is moderate. Approximately 15.0% of the cranium remains, including calvarial and occipital fragments. No teeth were recovered. No pathologies were observed.

Tomb 236

Skeleton A (B397, B418) is a child aged seven years +/- two years at death. Surface preservation of the skeletal material is quite poor with a concreted surface obscuring the ability to assess anomalies. Overall, 61.3% of the skeletal material cannot be assessed for pathologies. Approximately 35.0% of the skeleton is present, including about 25.0% of the cranium plus a mandible fragment. All of the arm long bones are represented bilaterally, though highly incomplete. Fragments of a femur, tibia, fibula and two metacarpals are present. None of the vertebrae, shoulder and pelvic girdles, os coxae, ribs and foot bones were recovered. There were six deciduous teeth and one developing permanent maxillary and six deciduous mandibular teeth examined, of which two mandibular teeth are in position. There were no pathologies observed on the bones. Three teeth display evidence of dental disease, in the form of a moderate line of supragingival calculus on the labial aspect of the deciduous left maxillary central incisor and small carious lesions on the occlusal surface of the left deciduous first mandibular and second maxillary molars. The right central maxillary incisor is not present and the caries are not represented on their opposing counterparts.

Tomb 237

Skeleton E (B451) is a female aged 24-38 years at death. Surface preservation is moderate to poor, described as chalky with some eroded areas. Overall, 21.7% of the skeletal material could not be assessed for pathologies. Approximately 45.0% of the skeleton is present, including about 25.0% of the cranium plus the mandible. Most of the arm long bones are represented bilaterally to some degree, with the left radius missing post-mortem. The only leg long bone present is an unsided femur. The right scapula and left clavicle, most of the hand bones, all of the wrist, feet and ankle bones, all the bones of the pelvic girdle and all but a few thoracic vertebrae fragments are absent. There were 11 maxillary and 13 mandibular teeth examined, of which five maxillary teeth and all but three mandibular teeth are in position. There is moderate dental disease observed. The left mandibular second premolar and canine teeth display moderate supragingival calculus and the mandibular right first molar and second premolar were both lost *in vivo*. As well, the right third molar was either lost *in vivo* or is congenitally absent. Heavy wear is noted on the right first mandibular premolar likely due to the loss of the second premolar and first molar from the same side. There were no pathologies observed on the bones.

Cranium A (B447) is a probable female aged 22-28 years at death. Surface preservation is quite poor: chalky with some eroded areas and highly fragmented. Approximately 45.0% of the cranium is present. Five maxillary teeth were examined. There were no pathologies observed on the bones or teeth.

Cranium B (B448) is an adult aged 20-32 years at death. Surface preservation of the cranial material is moderate to poor and highly fragmented. Approximately 25.0% of the cranium is present. There were six maxillary teeth and one mandibular tooth examined, all of which are loose. The right first maxillary molar displays heavy attrition, particularly on the mesial half of the occlusal aspect. There is no evidence of dental disease and no pathologies were observed on the bones. A right petrous temporal portion belonging to a subadult was also recovered within this context.

Cranium C (B449) is a very incomplete adult. Only approximately 2.0% of the cranium is present, consisting of indeterminate calvarial and occipital fragments. It does not seem that this conclusively represents an independent individual and likely is fragments from Cranium A or B which were both located very close by in the tomb. No pathologies were observed.

Cranium D (B450) is likely a subadult based on cranial thickness. Surface preservation of the cranial bones is moderate. Approximately 5.0% of the cranium present, consisting only of occipital, temporal and indeterminate cranial fragments. No teeth are present. No pathologies were observed.

Appendix E: Description of the skeletal remains by discrete mortuary feature derived from Souskiou-*Laona* cemetery with focus on the palaeopathology

**Note please that unless otherwise indicated, age estimation was based on molar wear (Miles 1963) or dental development (Ubelaker 1989) and sex determination was almost solely based on cranial features (Buikstra and Ubelaker 1994). If the pelvic bones were present, sex was assessed based on them (Brooks and Suchey 1990; Phrenice 1969). The 'B#' in brackets represents the context number arbitrarily assigned to a specific burial context within the tomb, as determined by the excavator and the on-site physical anthropologist. This number is for reference with the excavation records only and does not necessarily reflect a discrete individual or bonestack. It is used at times as a descriptor to differentiate amongst commingled material along with letters which were assigned to particular skeletal elements during excavation and planned accordingly within the records.

The tombs of Souskiou-*Laona* cemetery are unpublished in their entirety, though several are described in detail in a preliminary publication (Crewe *et al.* 2005). The inventory provided below solely discusses a sample of the human bone material which was recovered from each tomb and examined for anomalies for this research. Permission to study the human remains was kindly given by Dr. Kirsi Lorentz and any inquiries regarding the study of the human remains must go through her. All of the contextual information regarding tomb status, grave goods and tomb structure is kindly provided by Dr. Lindy Crewe along with generous permission from Professor Edgar Peltenburg. The tomb context information provided below is preliminary in nature and it cannot be used or reproduced without their permission.

A total of 27 tombs containing a minimum of 125 individuals were examined from Souskiou-*Laona* cemetery for this study. Several tombs (116, 120, 162, 172, 210, 213) were studied that were not included within this study as they are not from secure contexts[111]. While all the tombs at Souskiou-*Laona* are affected with fairly severe taphonomic damage, those that had burials which were disturbed due to human looting action were not included. All the human remains discussed come from tombs

[111] Please refer to Crewe *et al.* (2005) for information on tomb types based on looting action.

with mostly un-looted and undisturbed burial levels. This means that the sample provided here is not the complete mortuary population of Souskiou-*Laona* but a representative sample of the best provenanced skeletal material. The discrete individuals from the tombs are described in greater detail in Appendix D. The descriptions in this appendix relate primarily to the commingled material. The minimum number of individuals (hereafter MNI) from the entire skeletal sample studied is derived from the overall tomb analysis.

Tomb 108

Information regarding tomb structure and details of the burial for Tomb 108 can be found on page 54 of Crewe *et al.* (2005). The tomb status is partly looted, with intact burial. The MNI is two adults. Surface preservation of the skeletal material is moderate: chalky with some eroded areas. North Skeleton was articulated and represents an adult female aged 30-34 years at death. South Skeleton was disarticulated and represents an adult female aged 18-25 years at death. Both individuals are affected with dental disease in the form of several teeth displaying carious lesions. Only one individual displays LEH and calculus. Both individuals display osteoarthritic changes of at least one elbow and one female individual has a single toe which is affected.

Tomb 125

The location of Tomb 125, on the edge of the kafkalla outcrop was subject to severe taphonomic damage. According to excavation records, the status of the tomb is unknown at this point as it is difficult to assess whether all the damage is taphonomic or if looters also played a role in the poor preservation. There were ten crania sitting on top of a large bonestack undisturbed *in situ*. The MNI for the tomb is 12, based on the maxillary first molar, given that dentition can move through contexts, a more conservative MNI based on the right petrous portion of the temporal bone is nine. There are four adults, two adolescents and four subadults identified based on dental age estimations and skeletal development. The surface preservation of the bones is predominately moderate: chalky with some eroded areas. While the surface preservation of the dentition is fair to moderate with the majority of the teeth showing some enamel degradation and some pitting. Cranium A is an adult of indeterminate age and sex. Cranium B is a subadult of indeterminate age, and may be associated with another cranium context. Cranium C is an adolescent aged 16-20 years at death. Cranium D is a female aged 34-42 years at death. Cranium E is a female aged 22-28 years at death. Cranium F is most likely a child aged three to five years at death. Cranium G is a young adult aged 22-28 years at death with no sex assessment possible. Cranium H is an adult with no age and no sex assessment possible. Cranium I is most likely associated with Cranium B or J, as there are very few fragments preserved and most likely do not represent an independent subadult. Cranium J is an adult female with intrusive subadult cranial fragments. Based on the dentition recovered from all contexts within the tomb, the estimated ages of the subadults are: three to five years, seven to eleven years, five years +/-16 months at death and a perinatal infant. The estimated ages of the adults are: 34-42 years, 22-28 years and 22-28 years at death. Finally, the estimated ages of the adolescents are: 16-20 years and 12-18 years at death.

There was some post-excavation confusion between Crania A, C and F (along with D and E) as all were located near one other within the tomb and during excavation two different crania were labelled as Cranium C. After looking at the sketches (as there are no burial sheets for Cranium C or F), it was decided that the majority of the bone was from B321 and this was likely Cranium C whilst the smaller cranium (a probable subadult) was most likely Cranium F (B439). Neither Cranium C nor F is particularly robust and the only element which is duplicated is the right temporal petrous portion and the dentition reflects two different age estimations. Because the only duplicated bone is the right petrous portion and there is some similarity in size it is possible that because B321 is from SL03 while B439 is from SL04. They may represent the same skull which was left unexcavated at the end of SL03 and the whole lot is from one cranium, Cranium C, with Cranium F being represented solely by the right petrous portion and dentition. Based on size and age of individual, what is presented here is the best estimated conclusions based on the re-association of like cranial elements. The skeletal material, in general, was very mixed up or commingled within the tomb, as well, since most of the teeth are loose, it becomes very difficult to attribute age and sex assessments to a particular cranium or individual.

The bonestack and commingled material (B421, B422, B423, B424, B318 and B309) is represented by 535 teeth and bones or bone groups. Overall, 43.8% (n=215) of the skeletal material cannot be assessed due to poor preservation or high fragmentation. The bonestack and commingled bones represent all of the postcranial skeletal material recovered within the tomb. The postcranial material which had been included with the crania during excavation is from this bonestack and will be included with it. The perinatal infant is only represented by postcranial long bones and much of the dentition is found only within the bonestack. At least one of the individuals within the tomb is possibly male based on the characteristics of a mandible recovered within the bonestack.

In regards to pathological expression on the material within the bonestack, two bones display possible evidence of trauma. An intermediate hand phalanx displays an extreme palmar curvature with a thinning of the bones and osteophytic growth on the proximal epiphysis. While there is no explicit evidence of trauma, it seems probable. A radiograph is required to be certain. No pathologies were noted on any other hand phalanges (n=39) within the tomb. A section of a left femur appears to have a bowed diaphysis and roughness of the distal third. The bone is only approximately 60.0% complete from the distal third to the proximal third. It is a very gracile bone and a radiograph would be required to determine if there is a healed fracture present in the portion which is preserved.

Osteoarthritic changes to the epiphyses are the most common pathological changes affecting the postcranial bones. A minimum of five thoracic vertebrae display osteoarthritic changes to vertebral superior and inferior articular facets and one exhibits changes to the spinous process. This indicates that at least one individual within the tomb was affected with osteoarthritic changes to the spine. As well, at least one cervical vertebra displays extension of the superior articular facets. Two of four intermediate foot phalanges, one of two distal first foot phalanges and one of ten proximal foot phalanges are affected with osteoarthritic changes to the epiphyses, in the form of remodelled articular surfaces and osteophytic growth at the margins. None display any evidence of trauma. As well, a left first metatarsal has an osteophyte on the medial surface of the diaphysis. This may represent a minor trauma which has created an osseous growth as there is no evidence of a fracture. This could be caused by a repetitive or hard use of the foot. No other metatarsals are affected. A right scapula shows an active lesion in the glenoid fossa with bone growth along the superior margin which represents one-third of the right glenoid fossae recovered. Of the two left glenoid fossae observed, neither displayed any pathological change. There is no evidence of trauma, though the scapulae are highly fragmentary. No humerus fragments display any pathologies, however, it is likely that this lesion occurred due to a poor articulation with the humerus. A left first metacarpal exhibits a small osteophyte on the distal epiphysis. There is no evidence of trauma and no other metacarpals are affected with pathological changes.

A total of 189 teeth, both deciduous (n=9) and permanent (n=180) were examined for all individuals within Tomb 125. Dental disease affects at least 15 loose teeth within the tomb which cannot be attributed to an individual. Five loose mandibular molars display carious lesions. At least one of the individuals affected with caries is an adult aged 12-24 years at death, based on molar wear of the left first and right third molars affected. And a second individual, aged approximately five years +/-16 months displays two large caries on the occlusal aspect of the deciduous right mandibular first molar. LEH was observed on eight teeth. The developing mandibular first molars and maxillary second molar of an individual aged five years +/- 16 months all display at least one LEH (with two observed on the maxillary molar). The mandibular second molar and maxillary right first and second premolars of an individual roughly aged seven to eleven years at death displays one LEH. And a right central maxillary incisor and left maxillary canine of an adult each display one LEH. Therefore, at least three individuals within the bonestack material were affected by at least one physiological stress while the teeth were forming. As these teeth are loose in a commingled context it is impossible to compare them with the rest of the teeth from a specific individual. Three fully formed permanent teeth, a right maxillary canine and second premolar and a right mandibular canine, display supragingival calculus. Heavy attrition was recorded for at least five teeth. There is further evidence of dental disease within this tomb in the form of ante-mortem tooth loss. One of the seven (minimum likely number) mandibles observed has lost the right second and left first molars *in vivo* and a possible abscess has formed on the anterior aspect of the bone while there were no anterior teeth present. There is no evidence of trauma on the mandible and there are no teeth recorded with the bone. However this mandible is highly fragmentary.

The poor levels of preservation have most likely affected the results of the analysis of Tomb 125 as many of the small bones do not seem to have survived in a recognizable form. Because of the commingled nature of all the bone material, it is difficult to determine the true number of individuals affected with pathologies. At least one child aged five years +/- 16 months was affected with a caries and LEH. A second child aged around ten years at death displays one episode of LEH affecting three teeth. One adult (possibly Cranium E with loose teeth) displays LEH on a number of the teeth representing one episode of physiological stress in childhood. Dental caries affected at least one adolescent individual quite severely affecting up to six teeth. Finally, at least one adult individual displays mild to moderate supragingival calculus on three recovered teeth. Heavy attrition and ante-mortem tooth loss affects at least one adult individual respectively. Osteoarthritic changes of the spine affect at least one adult (possibly Cranium F as the first and cervical vertebrae most likely are associated with this cranium). At least one adult individual is affected with pathological changes to at least each a single a foot, hand and shoulder of a possible three individuals. It is impossible to determine if these all affect the same individual or multiple individuals.

Tomb 132

According to excavation records, Tomb 132 is partially looted with intact inhumations and contains two articulated adults and commingled material in the north section. The MNI is five, based the right talus, right fifth metatarsal, left maxillary second premolar and left mandibular third molar. The right fourth metatarsal possibly reflects a sixth individual, however this is the only element which does so and is seems that the more conservative number is appropriate. Surface preservation of the skeletal material within this tomb is moderate to poor, with most of the bones described as chalky with some eroded areas. Fragmentation of the bones is fairly low. Skeleton East is a probable male aged 24-36 years. Skeleton West is a probable female aged 28-36 years at death. There were three crania recorded from the bonestack. Cranium 1 represents an adult aged 30-38 years at death. Cranium 2 represents an adult aged 20-32 years at death and Cranium 3 represents an adolescent aged 16-20 years at death.

The Northern bonestack (B103, B104) includes cranial fragments which were recorded as three individual crania (see Individuals section). A total of 374 teeth and bones or bone groups were recorded for the bonestack, which most likely represents the postcranial remains and loose teeth of at least three individuals. The small bones and teeth are well represented within this tomb. The long bones are in poor preservation and are, for the most part very fragmentary, particularly the leg bones. Overall, 19.9% (n=81) of the skeletal material within the bonestack cannot be assessed for pathologies due to taphonomic damage.

There are 27 teeth and bones within the bonestack which display pathology. The pathologies affecting the commingled material predominantly involve the teeth, feet and hands. A fragment from the left side of a mandible exhibits ante-mortem tooth loss at the site of the left first mandibular molar. The alveolus is totally resorbed indicating that the tooth was lost sometime before death. There is no evidence of trauma or infection. This mandible fragment may be associated with the left first maxillary molar from Cranium 1 as it exhibits minimal wear. Four maxillary teeth and one mandibular tooth display a dental caries and one maxillary tooth and three mandibular teeth exhibit supragingival calculus ridges. These teeth are all loose and cannot conclusively be associated with an individual.

In regards to postcranial pathologies in the bonestack skeletal material, there are four foot bones which display evidence of trauma and eleven foot bones which display osteoarthritic changes with no evidence of trauma. Two intermediate foot phalanges show evidence of possible healed trauma with bone growth and general thickening of the diaphysis. A left second metatarsal and a right fifth metatarsal both display changes to the proximal epiphysis in the form of new bone growth which may reflect a poor articulation with their respective tarsals. None of the tarsals recovered within the tomb display any evidence of pathology. Four proximal, three intermediate and two distal foot phalanges display remodelling and/or osteophytic growth at the epiphyses which possibly reflect a poor articulation. There is no evidence of trauma on the foot phalanges or metatarsals. As well, two intermediate foot phalanges are ankylosed to distal phalanges, affecting the articulation of the proximal epiphyses of the intermediate phalanges. This possibly reflects trauma to the toes which caused the ankylosis of the phalanges together. A right scaphoid displays changes to the articular facet with the capitate in the form of bone growth and a right first metacarpal exhibits remodelling of the distal epiphysis and porotic new bone growth on the diaphysis which may indicated a healed trauma to the bone. As all these bones were recovered loose it is not possible to determine if they are from the same individual or if they possibly impacted the bones adjacent to them.

Overall, within this tomb, there is at least one individual who has suffered from trauma to at least one foot, with four intermediate phalanges and two distal phalanges affected of a possible four individuals (seven feet). As well, at least one individual displays osteoarthritic changes to at least one foot, with proximal, intermediate and distal foot phalanges affected again of a possible four individuals. This means that at least two feet display pathologies. This is possibly reflected in the degenerative changes observed on a right and a left metatarsal. Osteoarthritic changes of the hand are present on at least two individuals of a possible four, with the left first metacarpal affected, as well as a scaphoid and a second first metacarpal which shows evidence of trauma. At least two individuals were affected by dental caries (two left maxillary second molars display the lesion) of a possible five individuals with dentition in this tomb. Calculus is observed for at least one individual.

Tomb 155

According to excavation records, this tomb is partially looted with an intact burial and contains two articulated individuals. The MNI for this tomb is based on a number of bone and teeth elements and represents two adults. Surface preservation of the bones is moderate to poor: chalky with quite a bit of surface erosion. The bones are quite fragmentary. Skeleton A is an adult female aged 24-30 years at death. Skeleton B is an adult male aged 18-34 years at death. Overall, both individuals display mild dental disease in form of dental caries. There were no pathologies observed on the bones.

Tomb 158

The published information on tomb 158 can be found on pages 55-56 in Crewe *et al.* (2005). According to the publication, the tomb contains the remains of one articulated adult, four crania and two bonestacks and the tomb status is partially looted with intact burials (Crewe *et al.* 2005: 55). The MNI for this tomb based on the skeletal material observed for this research is nine with five adults and four subdaults. This differs slightly from the findings of Crewe *et al.* (2005: 56) which states that there are at least five adults and one subadult. Surface preservation of the skeletal material is quite good: chalky with minimal surface degradation. However, many of the bones are very incomplete and some are very fragmentary. Based on the os coxae from Bonestack E, there is at least one male adult, one female adult and one senior adult female. Overall, it would seem that there is one adult male (Skeleton A), two adult females (Crania D and E), an adult of indeterminate sex (possibly male – Cranium B) and one older adolescent (Cranium C) which comprise the skeletally mature group within the tomb. The four subadult individuals are aged, based on dentition and general skeletal development of material recovered from the bonestacks, around one year, two years, six years and seven years of age at death.

There were two bonestacks identified by the excavators. It must be kept in mind that these are arbitrary assignations of different bonestacks. For this tomb, the division will be maintained based on the relatively clear separation of the different stacks within the tomb. Bonestack C is located near the head of the articulated individual (south east corner of the tomb) and Bonestack E is located near the feet of the articulated individual (north west corner). All of the crania were placed on top of Bonestack E.

Bonestack C (B251, B256, B257) contains 288 teeth and bones or bone groups comprised of mixed adult and subadult material, including infant, child, adolescent and adult. Surface preservation is good to moderate with much of the bone described as chalky and some with erosion. Overall, 16.3% (n=47) of all the skeletal material could not be assessed for pathologies. Osteoarthritic changes are the most common pathology observed on the bones in Bonestack C. An atlas displays osteophytic growth around the articular facet with the axis and an axis displays osteophytic growth from the superior aspect of the dens, where the apical ligament attaches. At least two cervical vertebrae display osteophytic growth on the anterior aspect of the body and at least one lumbar vertebra shows extension of an articular facet and osteophytic growth on the body. Whether these vertebrae all come from the same individual is impossible to ascertain, though it seems plausible given the grouping of the bone together within this bonestack. One proximal, one intermediate and four distal hand phalanges display osteoarthritic changes predominately in the form of osteophytic growth at the articular surface of the distal epiphysis. As well, two left distal first foot phalanges display osteophytic growth on the proximal epiphysis. There is no evidence of trauma on any of the distal foot phalanges. The proximal and intermediate foot phalanges have evidence of possible trauma with bone growth on the diaphysis. However, a radiograph is needed to be certain. Three anterior teeth display moderate to severe supragingival calculus ridges. A right and left mandibular canine each exhibit one or more LEH and two maxillary molars display a carious lesion each.

Bonestack E (B250, B322) is composed of 536 teeth and bones or bone groups, containing infant, child, adolescent and adult remains. The surface preservation of the skeletal material is fairly good, predominately described as having a chalky surface with minimal taphonomic damage. Overall, only 11.2% (n=60) of the skeletal material cannot be assessed for pathologies. Calculus is the most common dental pathology affecting the teeth in Bonestack E. Of the all the teeth (n=157) recovered from Bonestack E, 12.7% (n=20) display mild to moderate supragingival calculus. At least three individuals display calculus as there are three left maxillary central incisors which exhibit the disease. A left and a right mandibular canine each display one LEH in the cervical third of the tooth.

Osteoarthritic changes are the most common pathology affecting the bones, particularly the feet, ankles and vertebrae. The tubercles of two left naviculars have been completely remodelled, making the tubercle appear compressed into the main body. A right fifth metatarsal displays extension of the medial tuberosity of the condyle on the distal epiphysis. The proximal epiphyses of two right first proximal foot phalanges display osteophytic growth and a left proximal first foot phalanx displays a globular bone growth on the proximal third which may represent an incidence of trauma which has not affected the articular surface. While there is no explicit evidence of trauma on the two right first proximal foot phalanges, it cannot be ruled out given the osteophytic growth on the medial aspect of the proximal epiphysis. Two proximal, two intermediate and three distal foot phalanges display possibly osteoarthritic changes to the epiphyses and/or thickening of the diaphysis. Radiographs are required to be certain of the causes of these bony changes.

A first and second cervical vertebrae both display bone growth reflecting a poor articulation of the dens and the dens facet of the atlas, respectively. As well, there is a lumbar and a thoracic vertebra which each display changes to the vertebral articular facets indicating that at least one individual within the tomb was affected with osteoarthritic changes to the spine. A glenoid fossa of a right scapula exhibits osteophytic growth around the margins of the articular suface with mild porosity indicating possibly osteoarthric changes. As well, a right radius displays remodelling of the proximal epiphysis in the form of a compressed head, with no changes to the articular facet. A radius from an indeterminate side exhibits changes based on a poor articulation with bone growth at the proximal neck and a remodelling of the superior aspect of the proximal epiphysis into an S-shaped facet. The lateral facets of a right and a left patella each display osteophytic growth at the margins of the articular surfaces. A right first metacarpal and an indeterminate metacarpal exhibit bone growth at the distal epiphysis. Finally, a distal hand phalanx displays bone growth on the proximal epiphysis. None of these bones have evidence of trauma. However, it cannot be ruled out.

A possible congenital developmental defect in the form of unfused sacral vertebrae is present in Bonestack E. In this case the second and third sacral vertebrae have not fused in an adult sacrum. There is no age or sex assessments possible with this sacrum. Thus, it is impossible to know whether this reflects a true defect. However, the second and third sacral vertebrae typically fuse between 18-24 years, while the third and fourth and the fourth and fifth sacral vertebrae typically fuse between 18-23 years. Given that the third and fourth and fourth and fifth sacral vertebrae are fused while the second and third are not, it seems plausible that this represents a true defect. This is the second sacra within this tomb to display this defect and may represent a genetic link between the individuals (Aufderheide and Rodriguez-Martin 1998: 65-66).

Overall, while the number of individuals affected with degenerative joint disease cannot be ascertained, it is clear that at least two individuals display osteoarthric changes to at least two body parts. Two sets of first and second cervical vertebrae of a minimum of three recovered display changes to the articular facets, as do two of three recovered right first proximal foot phalanges. The thoracic and lumbar vertebrae are affected with osteoarthritic changes in at least one individual. The right elbow and an indeterminate elbow are also affected, this may be from one individual. Eight radii still had their proximal epiphyses which means 25.0% of all proximal radii display a pathological lesion. Two knees, a right and a left patella, are affected with bone growth representing one individual of four possible left patellae. A right shoulder displays osteophytic growth on the glenoid of the scapula of three present and a minimum of one hand displays osteoarthritic changes of a possible four individuals. Three left central maxillary incisors display calculus. Therefore, of the five individuals with complete central maxillary incisors, a minimum of three display some calculus. At least one individual display LEH of the canines and one individual is affected by dental caries of the nine which have dentition within the tomb.

Tomb 159

According to the excavation records, Tomb 159 contains no articulated individual and nine crania, with commingled postcranial material and an intact tomb status. The MNI of the tomb is nine, with three subadults and six adults. Surface preservation of the bones is quite poor in general: chalky and severely eroded surfaces. The three subadults are aged around five years, seven years and nine years at death. In regards to the ages of the adult individuals, most of the teeth were recorded loose within the tomb making it difficult to assign individuals an estimated age. However, based on individual molar wear, it seems that there was a younger individual, aged 18-24 years at death, and at least two older individuals, aged 30-34 years and 32-38 years at death. Cranium A is an adult probable male. Cranium B is as adult male most likely aged 25-35 years at death. Cranium C is a child aged six to ten years at death. Cranium D is a child aged seven to eleven years at death. Cranium E is most likely a subadult. Cranium F is a probable female adult. Cranium G most likely represents an adult. Cranium H is a female adult aged 22-26 years at death. Cranium I is a probable female adult. It is possible that there were some articulated body parts within the bonestack based on tomb plans.

The commingled bonestack material (B200, B412) from within Tomb 159 contains 263 skeletal elements, including both subadult and adult material. Surface preservation of the skeletal material is very poor: chalky and severely eroded. Overall, 62.0% (n=163) of the material cannot be assessed for pathologies. There were 74 loose teeth recovered from within the bonestack. Mild to severe supragingival calculus is displayed on a left maxillary third molar and second molar, as well as a mandibular left lateral incisor. A left maxillary second premolar exhibits a large carious lesion on the distal aspect of the crown. Heavy attrition, wearing the tooth crown through the dentine and into the root, affects six maxillary teeth. Osteoarthritic changes affect an intermediate foot phalanx with extension of the proximal epiphysis and bone growth. A second cervical vertebra displays a rather large osteophyte on the superior aspect of the dens where the apical ligament attaches. As well, a lumbar vertebral body displays slight osteophytic growth along the margin.

Overall, the assessment of pathological expression in Tomb 159 is severely hampered by the extremely poor preservation of the bones. Not only is surface preservation very poor, but the bones are highly fragmentary and incomplete. However, several bones and teeth were able to be assessed, thus at least one adult individual had calculus build up on a number of the teeth, of the six adults with teeth within the tomb. One adult individual had at least one carious lesion of the nine individuals for whom dentition was recovered. One adult individual likely has some mild osteoarthritic changes to the spine and the foot of the possible two individuals represented by foot phalanges. Two of three individuals exhibit osteophytic growth on the superior aspect of the dens of the axis. There is no evidence of trauma and it is not possible to determine if there was bilateral expression of the pathologies discussed above.

Tomb 160

According to excavation records, Tomb 160 is partially looted with an intact burial and contains one articulated individual and four crania on a north section bonestack. The MNI is five based on the crania, dentition, left ulnae and contextual information. Surface preservation is predominately moderate, described as chalky with some eroded areas. However, the bones are highly fragmentary. There are two adult females, one adult male and two subadults; one aged around ten years at death and the other is younger of indeterminate age. Skeleton E is a male aged 18-24 years at death. Cranium A is a female with a rough age estimation of 22-28 years at death. Cranium B is a probable female adult aged 22-26 years at death. Cranium C is a child aged eight to twelve years at death. Cranium D is a subadult.

The bonestack in the north section (B198, B204) contains a total of 164 teeth and bones or bone groups of mixed subadult and adult material. Surface preservation of the skeletal material is moderate, described as mostly chalky and eroded. Overall, 26.5% (n=40) of the skeletal material could not be assessed. A total of 9.9% of the skeletal material within the bonestack can be attributed to subadult individuals. The pathologies observed on the bonestack elements are predominately osteoarthritic changes. There is only one tooth which displays a definite pathology in the form of a carious lesion on a mandibular left second molar. Heavy attrition, into the dentine of the crown affects two mandibular molars and a maxillary second premolar. The heavy wear on two of the teeth may have originated as a dental caries which was then severely worn down.

The proximal epiphysis of a left radius displays osteophytic growth around the margin of the superior surface of the head and along the posterior margin of the tuberosity. This most likely represents a poor articulation with the capitulum of the humerus. There is no evidence of trauma. The proximal epiphysis of a right first metacarpal displays osteophytic growth towards the palmar aspect. This remodelling of the proximal epiphysis would possibly have affected the movement of first digit as the articulation with the trapezium would be hindered. The anterior facet of a right navicular displays remodelling with would have affected its articulation with the cuneiforms. There is no evidence of trauma. Two proximal foot phalanges exhibit osteoarthritic changes in the form of bone growth at the proximal epiphyses, and in one case also at the distal epiphysis. There is no evidence of trauma. Two thoracic vertebral bodies and the articular facets of a lumbar vertebra display some form osteophytic growth. Evidence of trauma is visible on a right fifth metatarsal in the form of a bony growth on the lateral surface of the diaphysis. This does not affect the proximal epiphysis. A single indeterminate third through tenth rib displays a patch of new bone growth on the inferior aspect which may represent an incidence of trauma. In general, the ribs are too fragmentary to look for comparison.

Overall, within this tomb there is at least one adult individual who displays heavy attrition to their teeth. One adult individual has some osteoarthritic changes to the vertebral column. And there is at least one individual (the only one represented by the number of recovered foot phalanges) with osteoarthritic changes to the foot phalanges. One adult individual of four with proximal right radii was affected with osteoarthritic changes to the elbow. One individual has a first metacarpal affected with osteoarthritic changes of the two individuals with right first metacarpals in the tomb. One individual displays osteoarthritic changes to the right ankle from two possible individuals with right naviculars. Finally, the only individual with a fifth metatarsal suffered a minor trauma to the diaphysis. As well, at least two individuals display carious lesions as there are two right third maxillary molars affected of three individuals with third right maxillary molars.

Tomb 161

According to excavation records, Tomb 161 is partially looted with an intact burial and contains one articulated individual, two crania and at least one bonestack. The MNI for the tomb is three, based on a number of skeletal elements. Surface preservation of the skeletal material is good to fair, with most elements described as chalky or chalky with some eroded areas. This represents a probable adult male aged 22-36 years at death (Skeleton A), a young adult aged 18-22 years at death and an adult aged 20-28 years.

The bonestack (B209, B165) was located in the northwest corner of the tomb (this bonestack is often referred to as NW Bonestack within the notes). A total of 230 teeth and bones or bone groups were recovered from this context. Surface preservation of the skeletal material is good to fair, predominately described as chalky or chalky with some eroded areas. Overall, 15.2% (n=35) of the skeletal material could not be assessed for pathologies. Six mandibular teeth display mild to moderate supragingival calculus lines/ridges. There is no duplication of teeth, indicating that they possibly all come from the same individual. A left second maxillary molar displays a caries on the distal aspect. The pathologies observed on the bones, reflect osteoarthritic changes or possible trauma. Evidence of trauma is observed on two proximal foot phalanges which each display bony growth on the epiphyses and alterations to the diaphyses. As well, a left third and a left fourth metatarsal each display bone growth on the dorsal surface of their respective diaphyses. While there is no evidence of fracture, the osteophytic growth on the surface of the diaphysis of a metatarsal possibly represents minor trauma. An intermediate foot phalanx displays mild osteophytic growth around the margin of the proximal epiphysis. There is no evidence of trauma. The styloid process of a right third metacarpal extended with new bone growth. Finally, a patella from an indeterminate side displays osteophytes projecting distally on the anterior surface which likely represents mild ossification of the medial collateral ligament.

Overall, for Tomb 161 at least one individual had moderate calculus build up on their teeth, of a possible three individuals with dentition. And at least one individual displays a dental caries. At least one individual suffered with degenerative changes and trauma to several foot bones, representing at least one left foot, of at least two present. As well, at least one individual of a possible three recovered, is affected with degenerative changes of the wrist-hand. Skeleton A exhibits osteoarthritic changes to the lumbar vertebrae. Two un-sided patellae were recovered, of which one displays osteophytic growth on the anterior aspect.

Tomb 165

According to excavation records, Tomb 165 was sealed and intact and contains two articulated individuals and five crania with at least one bonestack in the north section. The MNI for Tomb 165 is seven, with six adults and one subadult. Surface preservation is moderate to poor, predominately described as chalky with some eroded areas. There are five possible females, one male and the subadult is aged six months to a year old at death. Skeleton E is a female aged 18-24 years at death. Skeleton F is a female aged 34-42 years at death. Cranium A is a probable female adult aged 24-30 years at death. Cranium B is a probable male adult aged 28-34 years. Cranium C is a probable female adult. Cranium D is a probable female aged 42-52 years at death. Cranium G is an infant aged six months to a year old at death.

The North bonestack (B237, B238, B205) and the commingled material (B162, B341, B445) are composed of the remains of at least five individuals within Tomb 165. A total of 415 skeletal elements or bone groups are from commingled contexts within this tomb and were examined. Surface preservation is generally moderate to poor with most of the material described as chalky with some eroded areas. Overall, 33.0% (n=137) of the skeletal material could not be assessed for pathologies. Osteoarthritic changes represent the greatest proportion of pathological changes to the bones. Fourteen elements display evidence of osteoarthritic changes to the epiphyses. The bones which are affected include: the distal epiphysis of a left fibula, superior articular facets of a left calcaneus, the distal epiphysis of a right first metatarsal and the proximal epiphysis of a right fourth metatarsal, the diaphysis and distal epiphysis of a left first proximal foot phalanx, the distal epiphyses of two proximal foot phalanges, the vertebral articular facet of two left rib fragments, the articular facet on a pedicle of a thoracic vertebra, anterior body of a lumbar vertebra, the distal epiphysis of a distal hand phalanx, and the lateral margin of an acromion of a right scapula. All of the above cases, display bone growth at the margins of an articular facet which is typically mildly expressed with only minimal bone growth.

The anterior crest of a right tibia displays new bone growth along its anterior margin, which may represent evidence of trauma. However, the bone is highly fragmentary and the extent of the bone growth is impossible to assess. Just inferior to the spinous process of the fifth sacral vertebra and on the posterior aspect of a right lateral cuneiform there is evidence of a past infections in the form of healed cloacae. These lesions are non-active and had likely healed many years before death. Only three teeth from the Bonestack exhibit dental disease, a right mandibular third molar and a maxillary left second premolar have carious lesions. The lesion on the third molar is so severe that a good portion of the crown is destroyed. And a mandibular right second premolar displays a mild ridge of supragingival calculus. As well, five teeth exhibit heavy attrition which has worn away the majority of the crown.

Overall in Tomb 165, at least one adult individual of the five within the tomb displays degenerative changes to the vertebrae and ribs. There are two tarsals, the distal epiphysis of a left fibula and the distal epiphysis of a first metatarsal which display a pathology affecting at least two ankles, representing possibly one individual of four possible adults with tarsals or two with right first metatarsals. A minimum of one left foot displays osteoarthritic changes to the phalanges and distal epiphysis of a metatarsal out of a possible five feet, two of which are left. One hand and one shoulder are affected with minor osteoarthritic changes of a possible four hands and two shoulders. At least two individuals display ante-mortem tooth loss in the maxilla, of a possible five maxillae which were partially present. At least two individuals were affected by calculus and caries, with duplicate teeth displaying pathology (left maxillary central incisor and left maxillary second premolar respectively) out of five adults with dentition. There is evidence that two individuals of the five adults present possibly display lesions associated with an infectious disease, metabolic disorder or hematopoietic disease. At least one individual presented a long healed site of infection in the sacrum out of two recovered sacra.

Tomb 168

According to excavation records, Tomb 168 contains no discrete articulated individuals and three crania with commingled postcranial material. However, based on the tomb plans it is possible that there are some articulated body parts within the commingled material. The MNI for this tomb is three, reflecting three skeletally mature individuals – an older adolescent female, a male and an adult of indeterminate sex. Surface preservation is predominately moderate, described as chalky with some eroded areas. Cranium A is a probable female aged 12-20 years at death. Cranium B is a probable male adult aged 28-40 years at death. Cranium C is an adult.

The commingled material (B213, B214, B215, B216, B217, B324, B325, B326, B327, B328, B329) within Tomb 168 represents all the postcranial bone within the tomb. A total of 461 teeth and bones or bone groups were examined. Surface preservation of the bones is predominately moderate: chalky with some eroded areas. The majority of the teeth are in quite poor condition. Overall, 29.4% (n=135) of the skeletal material cannot be assessed for pathologies. The bones which are affected by osteoarthritic changes include: the acromion of a left scapula, the proximal epiphysis of a right first metatarsal, the proximal epiphyses of two proximal first foot phalanges, the proximal epiphyses of two proximal foot phalanges, the distal epiphysis of an intermediate foot phalanx, the proximal epiphysis of a left first distal foot phalanx, the posterior aspect of the dens of a second cervical vertebra and the articular facets of two thoracic vertebrae. All of the bones above display remodelling of the articular surfaces and/or osteophytic growth at margins of the facets. There is no evidence of trauma on any of the bones. Two foot phalanges exhibit evidence of trauma. An intermediate and a distal foot phalanx are ankylosed together at an angle which likely reflects a fracture and a proximal foot phalanx has a bony growth on the diaphysis with remodelling of the epiphyses. Several teeth display dental pathology, including a maxillary left central incisor, mandibular left and right canines and a left lateral incisor have mild calculus flecks and a left and right mandibular molar each have a carious lesion. A maxillary left and right first molar and a left second premolar all exhibit heavy attrition into the dentine and in two cases, into the roots.

Overall, for Tomb 168 there is at least one individual who displays osteoarthritic changes to some of the vertebrae. The foot in particular is affected with several foot phalanges displaying degenerative changes. This may only represent one individual of a possible two individuals, as there is no duplication of elements. At least one individual of three with dentition displays dental caries and calculus. One individual of two with left scapulae displays a possible poor articulation of the shoulder.

Tomb 186

According to excavation records, Tomb 186 was looted with re-deposited fill and intact remains at the base of the tomb and the tomb contains two articulated individuals and no commingled material. The MNI for this tomb is two adults or older adolescents with minimal duplication of skeletal elements as there are very few remains preserved. It is possible that skeletal elements have migrated within the tomb fill, due to water movement over the millennia, into the unsecured contexts which were not examined for this study. Surface preservation is fair to moderate, predominately described as chalky with some eroded areas. However, the bones are highly fragmentary. There is some commingling of the lower limb bones of the two individuals. Skeleton A (B275) is an adult or adolescent with neither age nor sex assessments possible. Skeleton B (B274, B308) is an adult, again with neither age nor sex assessments possible.

Tomb 189

According to excavation records, Tomb 189 status is sealed with an intact burial at the base and contains two articulated individuals, two crania and a bonestack. The MNI for Tomb 189 is most likely four adults, all of which are female. Surface preservation is fair to moderate predominately described as chalky with some eroded areas. There is quite a lot of commingling of material of the articulated individuals, particularly of the lower limbs. Skeleton A is a probable female adult aged 18-24 years at death. Skeleton B is a probable female aged 20-24 years at death. Cranium C is a female with no age estimation possible. Cranium D is a probable female adult aged 18-22 years at death.

The West bonestack (B280, B337, B346) contains a total of 315 teeth and bones or bone groups. The surface preservation is fair to moderate: chalky with some eroded areas. However, the bones are quite fragmented and incomplete. Overall, 26.8% (n=84) of the skeletal material could not be assessed for pathologies. Dental pathology affects a total of nine teeth within the bonestack. A right maxillary central incisor, a left maxillary canine and a left mandibular third molar each display moderate supragingival calculus. A left and a right mandibular second molar each display a carious lesion. Four teeth exhibit LEH, a left and a right third maxillary molar and a left and a right first maxillary premolar. While all these teeth were found loose, it is possible that they are from the same person. There is no further evidence of dental pathology. The only bones affected by an osteoarthritic change are two left tarsals, the navicular and lateral cuneiform, both of which display remodelling and bony growth around the dorsal articular facets. There is no evidence of trauma. There are a couple of mandible fragments which display possible male traits, which do not seem to be associated with any individual within this tomb. It is most likely that they represent females who have been identified within the tomb, but are on the more robust end of the range of female.

Overall, within Tomb 189, there is at least one individual with osteoarthritic changes to the cervical vertebrae. One individual is affected by osteoarthritic changes to at least one hand of a possible four hands present, though it represents the only fourth metacarpal recovered. At least one individual suffered from osteoarthritic changes to one left ankle, which is the only left ankle present with a navicular and lateral cuneiform. At least one individual has lost a mandibular tooth *in vivo*, of a possible three individuals with mandibles. Of the four dentitions present, one individual suffered from carious lesions, at least one individual displays LEH on several teeth and two individuals exhibit supragingival calculus (as two right maxillary central incisors display the pathology).

Tomb 190

According to excavation records, Tomb 190 status is intact but disturbed by erosion and the tomb contains two crania and two bonestacks. The MNI for Tomb 190 is three, with two subadults aged three to five years at death and seven to thirteen years at death and one probable female adult aged 18-26 years at death. The surface preservation of the skeletal material for Tomb 190 is very poor. There was very few bones recovered and overall, 80.9% of the material could not be assessed for pathologies. Cranium A represents a probable female adult aged 18-26 years at death. Cranium B represents a probable child aged seven to thirteen years at death.

Bonestack C (B272, B273) consists of a total of 23 teeth and bones or bone groups, of which 56.5% of the material is dentition. The surface preservation is moderate to poor: chalky with some eroded areas. Overall, 69.6% (n=16) of the skeletal material in Bonestack C cannot be assessed for pathologies. There were no pathologies observed.

Bonestack D (B289) consists of a total of seven postcranial bones, none of which could be assessed for pathology. Preservation is very poor with all the bones less than 75.0% complete and surface preservation predominately described as concreted. No pathologies could be observed.

There was a commingled context examined as well (B269). A total of 30 teeth and bones or bone groups were examined of which 70.0% (n=21) could not be assessed for pathology. Preservation is quite poor with high levels of fragmentation and low levels of completeness. Overall, 73.3% (n=22) of the skeletal material is dentition, including that of a subadult aged three to five years at death. There were no pathologies observed on this material. The poor preservation of Tomb 190 due to severe taphonomic damage made assessment difficult, if not impossible, as much of the material was missing or in extremely poor condition.

Tomb 192

According to excavation records, Tomb 192 is recorded as having a disturbed capstone with an intact burial and the tomb contains one articulated individual, six crania and one bonestack. The MNI for Tomb 192 is nine, based predominately on the dentition and several commingled postcranial bones. There are six adults, tentatively five females and one male, and three subadults, aged: perinatal, one to three years and two to five years at death. Surface preservation of the skeletal material is fair to good, and is described as chalky. Skeleton A represents a probable female aged 22-38 years at death. Cranium B represents a probable male aged 22-28 years at death. Cranium C represents a probable female aged 22-28 years at death. Cranium D represents a child aged two to four years at death. Cranium E represents a female aged 20-28 years at death. Cranium F represents a female aged 18-26 years at death. Cranium G represents a female aged 28-42 years at death.

The bonestack (B260, B294, B342) within Tomb 192 is quite large. A small portion is called Bonestack D, but based on the plans it seems to be all from one context. A total of 710 teeth and bones or bone groups were examined containing a mix of adult and subadult material from several individuals. Surface preservation is fairly good, predominately described as having a chalky surface. Overall, only 18.1% (n=115) of all the bonestack material could not be assessed for pathology and just over a quarter (25.2%, n=179) of the elements belong to subadult individuals, none of whom display any pathologies.

Osteoarthritic changes represent the greatest proportion of pathologies affecting the adult bones within the bonestack material of Tomb 192. These changes predominately take the form of bone growth, porosity or remodelling of the articular surface. Two cervical vertebrae bodies, four thoracic and two lumbar vertebrae facets display osteophytic growth and extension. Therefore, at least one individual displays osteoarthritic changes to the vertebral column. This is also observed on several rib fragments which show bone growth at the articular facets. A left scapular fragment displays fairly extensive bone growth along the margins of the glenoid fossa and an unsided acrominon shows active bone growth on the anterior aspect, there is no evidence of poor articulation. There are only four humerii with intact proximal epiphyses, none of which display any pathological changes. A right and a left humerus each display extension of the olecranon fossa along with bone growth within the fossa, indicating a poor articulation with the ulna. A right ulna displays an extended radial notch with bone growth along the posterior margin and the olecranon process of a left ulna is porous with remodelled bone. None of the proximal radii preserved display any pathologies. It is unknown, but possible that all these bones are from one individual. A left hamate displays bone growth around the margins of an articular facet which is not observed on any of the other carpals recovered. A left fifth metacarpal displays rough bone growth on the proximal epiphysis and a right first metacarpal has bone growth along the plantar aspect of the proximal epiphysis. As well, an intermediate and two distal hand phalanges show bone growth on the proximal epiphyses. Thus at least one right and one left hand display osteoarthritic changes. An indeterminate distal femur fragment displays an osteophyte on the articular surface, which may reflect a poor articulation with the tibia. A left and two right tali display similar morphological changes and osteophystic growth along the margins of the calcaneal articular facet. A left navicular shows extension of the distal facet. A right first metatarsal displays osteophytic growth on the dorsal aspect of the distal epiphysis and the lateral facet of the proximal epiphysis of a right third metatarsal exhibits bone growth. Three proximal foot phalanges display osteoarthritic changes, two of which may be due to trauma, however there is no explicit evidence of trauma. An intermediate and a distal foot phalanx each display osteophytes from the proximal and distal epiphyses respectively. Finally, both the proximal and distal epiphyses of a right first proximal foot phalanx display porosity and bone growth. Thus the ankle/foot is the most commonly affected joint. None of the bones described above show any evidence of trauma. It is impossible to know if they affected the bones adjacent to them.

There are three incidences of trauma. The distal epiphysis of a left humerus displays inactive bone growth indicating a severe poor articulation. A proximal foot phalanx displays a bony growth on the diaphysis. Finally, a proximal hand phalanx is extensively remodelled and mis-aligned with an inactive cloaca in the middle of the diaphysis. Dental disease is the second greatest proportion of pathologies within the bonestack. Just over half (53.5%, n=23) of all adult dentition recovered displays mild to moderate supragingival calculus and a right mandibular first premolar also displays a LEH along with calculus. There were no dental caries observed on any of the loose bonestack teeth. There is one mandible fragment which exhibits ante-mortem tooth loss of the left first molar with total resorption of the alveolar bone.

Overall, the skeletal remains of Tomb 192 display a rather high proportion of pathological expression. At least one individual displays osteoarthritic changes to the spinal column, with all three vertebral groups affected. There are several ribs which also display osteophytic growth to the articular facets. The left shoulder of one individual of a possible seven left scapula displays osteoarthritic changes. At least two individuals have degenerative changes to at least one elbow based on: two of five possible distal left humeri, one of six possible distal right humeri and one right ulna and one left ulna displaying osteoarthritic changes. At least one of four left and one of five right hands/wrists were affected with degenerative changes affecting a left hamate, one left and one right metacarpal and three hand phalanges. Only one knee represented by a single distal femoral fragment, of three possible distal femora, is affected with degenerative changes. At least two individuals have degenerative changes to the ankle: two of a possible three right tali and one of a possible four left tali and a single left navicular of a possible four, display osteophytic growth at the margins of the articular facets. At least one foot of a possible four, displays osteophytic changes, with a right first metatarsal, four proximal, one intermediate and one distal foot phalanges affected. At least three individuals display calculus build-up on at least a few teeth. While at least one individual is affected with dental caries and one displays LEH on at least one tooth out of a possible nine dentitions present.

Tomb 193

According to excavation records, Tomb 193 is partially looted with an intact burial and contains one articulated individual, three crania and one bonestack. The MNI is three adults. Surface preservation of the skeletal material is fairly poor and predominately described as chalky with some eroded areas. Preservation of the cranial material is quite poor and the sex determination is tentative for all three individuals, but it seems that there is one male and two females. All the individuals are quite young based on the few teeth recovered. Skeleton E is an adolescent with a tentative age of 16-20 years at death. Cranium B represents, very tentatively, an adult female. Cranium C represents, very tentatively, an adolescent female aged 16-20 years at death. Cranium D represents, very tentatively, an adult female aged 18-24 years at death.

The skeletal material from Bonestack A (B276, B277, B306) is highly fragmentary and there is a lot of commingling of cranial elements with the bonestack material. It seems likely that the crania listed above do not necessarily indicate discrete individuals. There are several cranial fragments from around Cranium D which may be from a younger individual as they are quite thin. Several skull bones (bone UU2 and bone AA) are sexed as male within the bonestack indicating that at least one individual is most likely male. A total of 196 teeth and bones or bone groups were examined for Bonestack A, none of which are hand/wrist bones. Surface preservation of the skeletal material is moderate to poor, predominately described as chalky with some eroded areas. Overall, 44.9% (n=88) of all the bonestack material could not be assessed for pathologies. A fragment of right maxillary fragment has lost the right first molar *in vivo*. The only other dental pathology expressed within the bonestack material are LEH on a maxillary left and right first molar, a left maxillary first premolar and left mandibular first molar. Several bones displayed osteoarthritic changes, including a left humerus which shows new bone growth in the olecranon fossa around a large septal aperture, a right os coxa with new bone growth and remodelling of the acetabulum and a lumbar vertebra exhibits osteophytic projections from the anterior margin of the body. There is no evidence of trauma on any of these bones.

Overall, within Tomb 193 there is at least one individual who displays osteoarthritic changes to the vertebrae. At least one of three recovered os coxae displays osteoarthritic changes to the hip and one of three individuals with distal epiphyses of the left humerus display degenerative changes. As well, at least one individual, of two possible, displays osteoarthritic changes to the hand. At least one individual suffered from dental disease, with *in vivo* tooth loss from the right and left maxillae. At least one individual displays LEH, possibly on several teeth as there is no duplication of teeth with the defect.

Tomb 195

According to excavation records, Tomb 195 status is largely looted with an intact burial at the base and contains one articulated individual. The MNI for Tomb 195 is one. Surface preservation of the skeletal material is quite variable across the tomb, with all bones chalky and some displayed mild to severe erosion. Overall, 46.7% (n=42) of the skeletal material could not be assessed for pathologies. A small amount of skeletal material was recovered as commingled material (B266, B295, B330). This is most likely associated with Skeleton A. There is only one duplicated element, a right central mandibular incisor, one of which comes from the commingled bone and is likely intrusive. Skeleton A (B267, B296) is a probable male aged 30-38 years at death. There were no pathologies observed on any of the skeletal material.

Tomb 200

According to excavation records, Tomb 200 status is partially looted with an intact burial and contains two articulated individuals, two crania and one bonestack. The MNI for Tomb 200 is five adults, based on a number of small bones. Surface preservation of the skeletal material is fair to moderate with the majority of the bone described as chalky or chalky with some eroded areas. Three males and one female are well represented, with very few bones indicating a fifth individual. Skeleton C is a probable male aged 21-46 years at death. Skeleton D is a probable female adult aged 32-42 years at death. Cranium A represents an adult male with no age estimation possible. Cranium B represents an adult male with no age estimation possible.

A small number (n=28) of bones fall between Skeletons C and D and cannot be conclusively associated with either at this point. Of these bones only a single lumbar vertebra displays severe osteophytic growth around the anterior and lateral aspects of the body. As both skeletons display osteoarthritic changes to the spine, this bone cannot be conclusively assigned to either.

Tomb 200 contained a very large bonestack (B399, B454, B455). A total of 397 teeth and bones or bone groups were examined. Surface preservation of the skeletal material is moderate, predominately described as chalky with some eroded areas. Overall, 20.2% (n=80) of the skeletal material could not be assessed for pathologies. There is no evidence of dental disease on any of the 38 teeth recovered. However, there is evidence of severe ante-mortem tooth loss. The right lateral incisor, canine, first premolar and first molar were lost *in vivo* from a fragment of right maxilla. The locations of the first premolar and the first molar are totally resorbed and the locations of the incisor and the canine still have active bone resorption. As well, a small fragment of mandible has mildly porous bone where the right first molar has been lost *in vivo*. Eight teeth display heavy attrition which has worn well into the crown of the affected tooth.

Osteoarthritic changes represent the most common postcranial pathology observed within the bonestack material. At least one cervical, several thoracic and one lumbar vertebrae display either osteophytic growth on the anterior margins of the body or extension of the articular facets. The proximal head of a left radius displays slight osteophytic growth along the superior-lateral margin of the facet. A left hamate exhibits porosity of the articular facet with the capitate. A left fragment of ilium displays osteophytic growth along the superior margins of the acetabulum. A left femoral fragment has mild osteophytic growth along the margin of the patellar surface of the distal epiphysis and a right and left patella each display osteoarthritic changes to their articular facets with some porosity and bone growth, as well the proximal epiphysis of a left tibia displays osteophytes around the articular surface. Five tarsals, a left talus, a left navicular, two right naviculars and a right medial cuneiform, are all affected with osteophytic growth at the margins of at least articular facet. The proximal epiphyses of a left and a right fifth metatarsal are extended, with porotic bone growth and remodelling of the articular facet. Nine proximal foot phalanges display bone growth, in six cases the epiphyses are affected, while in three cases there is bone growth on the diaphysis which may reflect trauma. One left and four right first proximal foot phalanges show evidence of osteoarthritic changes at the epiphyses with no obvious signs of trauma. Three left and one right first proximal foot phalanges display osteophytic growth are the margins of the proximal epiphysis. Again this is no explicit evidence of trauma.

Three bones display evidence of trauma. A right fibula shows rough and porous bone growth on the diaphysis just above the distal epiphysis with osteophytic growth at the margins of the distal medial articular surface. A left fifth metatarsal shows a significant callous where the two ends of a fracture mid-diaphysis did not re-align and the distal half has ankylosed to the dorsal surface of the proximal half. There is no evidence of infection, but it would have affected the shape of the foot. Finally, a proximal foot phalanx displays a significant curve in the diaphysis which most likely reflects a healed fracture. A radiograph is required to discuss this further.

Overall, the individuals within Tomb 200 display a number of pathologies on the skeletal material. A minimum of four individuals are affected with some form of degeneration of one or more joint. At least two individuals’ spinal columns of a possible five individuals display osteoarthritic changes, in one case to quite a severe degree possibly reflecting ankylosing spondylitis. At least one left radius of five with a proximal epiphysis and one left hamate of two recovered display osteoarthritic changes. A left acetabulum, distal epiphysis of a femur, patella and proximal epiphysis of a tibia display osteoarthritic changes which may reflect one left leg. Only two left os coxae, three distal femora, one left patella and one proximal tibia are present. A right patella also displays evidence of osteoarthritic changes. At least two right and one left ankle are affected with degenerative changes, of five left and four right ankles present. At least three feet, of a possible nine (five individuals) within the tomb displays osteoarthritic changes. Four of six right first proximal foot phalanges display osteoarthritic changes and three of four left distal first foot phalanges are affected. Overall, at least three left and four left feet display at least one joint with osteoarthritic changes. Trauma has affected at least four bones within the tomb, which is quite high for a Souskiou-*Laona* tomb. While there is no duplication of bones which display trauma, it seems unlikely that all these bones belong to one individual, and more likely reflect a minimum of two. At least three of five individuals display ante-mortem tooth loss. Calculus and dental caries each are only observed on the articulated individuals affecting two individuals each. As well, one individual displays possible congenitally unfused sacral vertebrae.

Tomb 201

According to excavation records, Tomb 201 status is largely looted with an undisturbed burial at the base and contains an articulated individual, a cranium and a bonestack. The MNI for Tomb 201 is securely given at five, including two adults, a foetus, a perinatal infant and an infant aged one to one and a half years. Surface preservation of the skeletal material is predominately moderate, described as chalky with some eroded areas. There are several bone elements (n=4) from the right and left feet which indicate that there may have been three adults within the tomb, but this is not reflected in the majority of the material. Skeleton A is a female adult aged 28-34 years at death. Cranium B represents a male adult aged 24-34 years at death.

All of the subadult material is contained within bonestack (B356, B398, B456) within Tomb 201. A total of 194 skeletal elements were examined from the bonestack, of which 29.9% is subadult skeleton. Surface preservation of the skeletal material is moderate to poor, described as chalky with some eroded areas. Overall, 36.1% (n=70) of the skeletal material within the bonestack could not be assessed for pathology. None of the subadult remains display pathology. The only pathology observed on the bonestack material affects a mandible fragment which displays ante-mortem tooth loss of the right second molar and the alveolar bone is totally resorbed. Skeleton A displays the majority of the pathologies within the tomb, in particular a mal-healed fracture of the right radius. One vertebra of two possible adult individuals displays osteoarthritic changes. And only one individual in general seems to have been affected with osteoarthric changes. One of one right acetabula, one two right calcanei, one of three right fourth metatarsals and one of two right first proximal foot phalanges which were recovered displays osteoarthritic changes.

Tomb 207

According to excavation records, the status of the tomb is unsealed but intact and contains three articulated individuals, four crania and at least one bonestack. The MNI for Tomb 207 is difficult to assess as the material which is present is highly fragmentary and incomplete. Based on bone element duplication there are five adults and one subadult. However when contextual information is considered and ages of individuals included, the MNI becomes eight with five adults, two adolescents and one child aged three to seven years. Surface preservation of the skeletal material is poor, described as chalky and eroded. Skeleton E is a probable female adult aged 22-30 years at death. Skeleton F is a probable adolescent female aged 16-22 years at death. Skeleton G is a probable female adult aged 22-36 years at death. Cranium A represents a probable female adult. Cranium B represents a probable female adult. Cranium C represents an adolescent individual aged 10-14 years at death. Cranium D represents a probable female adult aged 18-22 years at death.

Bonestack D (B288, B386) contains a total of 100 teeth and bones or bone groups. There is minimal subadult material within the bonestack, confirming that at least one child is present in the tomb. Surface preservation is quite poor with the majority of the material described as chalky and eroded. Overall, 64.0% (n=64) of the skeletal material could not be assessed for pathologies. The only pathologies observed on the bonestack material relate to dental disease. A left mandibular first molar has been lost *in vivo* and the alveolar bone was actively resorbing at death. Two mandibular molars exhibit very heavy attrition into the root with secondary dentine formed.

There is a fair amount of commingled material (B381, B284) within Tomb 207, including a group of bones which belong to a possible discrete individual (B403) but cannot be conclusively associated with a particular individual and so was included within the commingled material. A total of 94 commingled skeletal elements and bone groups were examined. Overall, preservation is quite poor, as the majority of the material is mostly incomplete, highly fragmentary and described as chalky and eroded. The poor preservation is reflected in the calculation that, 60.6% (n=57) of the skeletal material could not be assessed for pathology. Another mandible fragment displays ante-mortem tooth loss of the right second molar with mostly inactive bone. A maxillary left first molar displays heavy attrition and a mandibular right first molar exhibits unusual wear patterns due to the loss of the second molar and an unusual tilt to the third molar.

Overall, preservation is detrimental to any palaeopathological examination in Tomb 207. No subadult remains displayed any pathologies. Ante-mortem tooth loss in the mandible was observed on at least one individual of three with mandibles. Heavy attrition is observed on at least one adult individual of five with dentition. Only one tooth displays a carious lesion, affecting one individual of three with a mandibular left canine.

Tomb 208

According to excavation records, Tomb 208 is intact but unsealed within which there was a possible bonestack. The MNI for Tomb 208 is one adult of unknown sex and age. Surface preservation for this context is very poor, described as chalky and eroded. Overall, 70.0% (n=28) of the skeletal material could not be assessed for pathologies. This is a small tomb context with only commingled skeletal material (B291, B316, B317) which could represent a single individual. A total of 40 teeth and bones or bone groups were examined for this tomb. There is no duplication of bones and the only tooth recovered is a right first premolar. If it is a single individual within this tomb, approximately 15.0% of a skeleton is present. No cranial fragments were observed, only one humerus, one ulna, a clavicle, a lunate and four hand phalanges represent the arms. The long bones of the leg are present though highly fragmentary as are the vertebrae and the ribs. Only two tarsals, two metatarsals and three phalanges remain of the feet/ankles. The only bone which displays pathology is a left talus with osteophytic growth around the head and medial aspect of the articular facet.

Tomb 220

According to excavation records, Tomb 220 status is largely looted with an intact burial at the base and contains one articulated individual, five crania and four bonestacks. The MNI for Tomb 220 is seven. Surface preservation is predominately moderate to poor with most of the material described as chalky with some eroded areas. Four are probable female adults/adolescents and two are probable male adults (two mandibles and three os coxae from the bonestacks indicate males). There is one bone and one deciduous tooth which represents a subadult, but no other skeletal material was observed. Skeleton A is a probable female aged 24-28 years at death. Cranium B represents an adult female. Cranium C represents a probable female adult. Cranium D represents a probable female. Cranium E represents a probable adolescent. Cranium F represents a probable male aged 18-30 years at death.

Bonestack A (B390) is a small context. A total of 76 skeletal elements and bone groups were examined. Surface preservation of the skeletal material is moderate predominately described as chalky with some eroded areas. Overall, 28.9% (n=22) of the skeletal material could not be assessed for pathologies. One tooth of four recovered, a right maxillary third molar, displays heavy attrition. The only pathologies observed are osteoarthritic changes to the bones. A right radius displays osteophytic growth along the posterior margin of the radial tuberosity and osteophytic growth at the margins of the distal articular surface. The acetabulum of a left ox coxa exhibits new bone growth and remodelling of the articular surface, reflecting a poor articulation. Finally, a right second metatarsal shows extension of the lateral facet which would have affected articulation with the third metatarsal.

Bonestack B (B465) is a very large context where most of the postcranial material within the tomb is found. A total of 480 teeth and bones or bone groups were examined from Bonestack B (excluding mandible BU which is associated with Cranium F). Surface preservation of the skeletal material is fair to moderate with only 8.5% (n=41) which could not be assessed for pathology. A possible congenital anomaly affects a sacrum, as the first sacral vertebra in what looks like an adult individual did not fuse to the second reflecting a possible transitional lumbosacral vertebra. However, as the first and second sacral vertebrae are the last to fuse, it is possible that this is simply a younger individual, under the age of 33 years. The first sacral vertebra is only 20.0% fused by age 20 years. It was not possible to assess sex as there was not enough of the sacrum present.

Dental disease and osteoarthritic changes are the most frequently occurring pathologies within Bonestack B. Two second cervical vertebrae display osteoarthritic changes to the dens: in one case there is a groove along the posterior aspect at the base most likely caused by pressure from the transverse atlanto-odontoid ligament; the other axis has osteophytic growth from the superior aspect of the dens. One thoracic and two lumbar vertebrae display extension of the articular facets, while a third lumbar vertebral body has osteophytic growth at the margins. A right scaphoid displays extension of the articular surface for the capitate towards the dorsal aspect. The proximal epiphysis of a left first metacarpal shows osteophytic growth towards the lateral aspect. A fragment of sternal body displays osteophytic growth at the margins of the costal notches and porosity within the notches. Both a right talus and a right navicular display osteoarthritic changes to the articular surfaces, with remodelling of the tubercle and calcaneal articular surface, respectively. Both a right first metatarsal and fifth metatarsal display bone growth on the diaphysis with no evidence of fracture, this likely represents a minor trauma. Four proximal foot phalanges exhibit pathology, three in the form of osteophytic growth at the distal epiphysis and one with an osteophyte on the diaphysis which possibly represents trauma. A left proximal first foot phalanx has osteophytic growth from the proximal epiphysis. Unless noted, none of these bones display evidence of trauma. Sixteen teeth display mild to moderate supragingival calculus. This represents 20.5% of the teeth recovered from the Bonestack B, reflecting at least two individuals with calculus as there is duplication of several teeth with the pathology. A single right first mandibular molar displays a carious lesion and two mandible fragment exhibits either ante-mortem tooth loss or the congenital absence of the left second and third molars and the right third molar. The alveolar bone of the mandible is completely resorbed. In a rare case of severe trauma at Souskiou-*Laona*, a left tibia and fibula have become ankylosed together near the distal end of the bone. This represents a healed broken ankle, the ankylosing of the bones would have likely resulted in limited movement (see Ortner 2003: 157-8 for a similar case).

Bonestack C (B466) is a relatively small bonestack. A total of 47 skeletal elements and bone groups were examined for this context. Surface preservation is fair to moderate with only 8.5% (n=4) of the skeletal material which could not be assessed for pathologies. Osteoarthritic changes to the bones are the most commonly observed pathologies within this bonestack. The hamulus of a right hamate is remodelled and resorbed into the body, with no evidence of trauma. The distal epiphysis of a left distal first hand phalanx is very flat with bone growth down the diaphysis and a distal hand phalanx displays an osteophyte on the proximal epiphysis. One proximal and two intermediate foot phalanges display severe osteophytic growth from the proximal epiphysis. There is no evidence of trauma on the bones. The only tooth which displays pathology is a left first molar which exhibits a mild supragingival calculus line.

Bonestack D (B467) is the second largest bonestack in Tomb 220. A total of 129 skeletal elements and bone groups were examined for this context. Surface preservation of the skeletal material is moderate: chalky with some eroded areas. Overall, only 8.5% (n=11) of the skeletal material could not be assessed for pathologies. The proximal epiphysis of a right radius is remodelled though the superior articular surface does not appear to be affected with the head narrowed/compressed on the posterior aspect. Four distal hand phalanges display osteophytic growth from the proximal epiphyses. The acetabulum of a right os coxa displays osteophytic growth around the anterior-inferior margins. There is no evidence of trauma. Mild to severe supragingival calculus is observed on 34.8% (n=8) of all the teeth within this bonestack. A single right deciduous second maxillary molar displays a carious lesion. Severe attrition is observed on four teeth, three of which also display calculus.

Overall for Tomb 220, at least one individual displays osteoarthritic changes to the spine. This may be connected to the congenital transitional sacral vertebra as clinical evidence seems to indicate that a lack of fusion of the first sacral vertebra may put greater stress on the other vertebrae in the spinal column (Shetty and Menenzes 2009: e86). Since two second cervical vertebrae display osteophytic growth it is possible that two individuals were affected with degeneration of the vertebrae. At least two individuals of six with left ulnae display extension of the radial notch. At least one right wrist and one left hand of four each display osteoarthritic changes which would have affected the movement of the joint. At least one individual of six with right acetabula displays osteophytic growth at the articular margin. At least one right ankle of four possible right ankles displays osteoarthritic changes to at two tarsals. At least one right and one left foot of six of each is affected with osteoarthritic changes to one or more bone. One individual of at least three with lower leg bones within Tomb 220 suffered a broken ankle, which had healed and fused the distal ends of the fibula and tibia together which would have had a limiting effect on movement. At least three individuals display supragingival calculus. At least two individuals were affected by dental caries, including a subadult. Finally, at least two adult individuals of five with mandibles display ante-mortem tooth loss.

Tomb 221

According to excavation records, Tomb 221 is largely looted with intact remains at the base and contains a single articulated individual. The MNI based for Tomb 221 is one adult. Preservation of the skeletal material from Tomb 221 is very poor as it is highly fragmentary with moderate surface preservation. Skeleton A is a probable female aged 24-28 years at death. There were no pathologies observed on the bones or teeth.

Tomb 228

According to excavation records, Tomb 228 status is unsealed but with an intact burial however, there was a looting attempt during excavation and some of the material was disturbed. The looted material is considered commingled and not related to a bonestack. The tomb contains one articulated individual, four crania and one bonestack. The MNI for Tomb 228 is six representing five adults and one infant aged six months to one year old at death. Surface preservation of the skeletal material is fairly good with the majority of the surface preservation described as chalky with some eroded areas or better. Skeleton E is a probable female aged 22-28 years at death. The context number for Cranium A (B385) does not include any cranial material, just an indeterminate os coxa fragment and an indeterminate bone. Cranium B represents an adult male. Cranium C (B383) reflects an adult, represented by less than 25.0% of a right parietal which was recovered in fair preservation with no pathologies observed. Cranium D represents an adult.

The bonestack (B387) is a fairly large context. A total of 297 skeletal elements and bone groups were examined. Surface preservation of the skeletal material is moderate or better with only 7.4% (n=22) of the skeletal material which could not be assessed for pathologies. Twenty-six teeth display calculus, representing at least two adult individuals (50.0% of the 52 teeth in the bonestack). The teeth displaying calculus predominately come from two mandibles which were recovered in fairly good preservation. One represents a female aged 22-42 years at death (mandible SS). The other is a male with an aged 24-68 years at death (mandible CC) and displays unusual wear on the dentition in position, with the left side displaying significantly less wear than the right side. As well the teeth on the right side of mandible CC look like they have continued erupting indicating that there were possibly no maxillary teeth with which to occlude. Other dental disease is recorded for a left third mandibular molar which displays a carious lesion. Ante-mortem tooth loss was observed on one mandible fragment. A left first and second molar have been lost *in vivo*, with active bone remodelling still visible where the first molar was positioned. Five teeth are heavily worn into the tooth crown. There is no evidence of LEH.

Osteoarthritic changes are the most common pathology affecting the bones in the bonestack. One atlas displays osteophytic growth at the articular facet with the dens of the axis and three axes display some form of osteophytic growth of the dens. As well, at least three cervical vertebrae bodies have osteophytes projecting from the anterior margin and an indeterminate vertebral body fragment displays large osteophytes. The radial and lunar notches of a left ulna display porous bone and extension of the articular surfaces. A left navicular displays significant osteophytic growth on the dorsal margin of the proximal facet which would have affected articulation with talus. Three proximal foot phalanges display osteophytic growth on the margins of the proximal epiphysis and one has new bone growth on the distal epiphysis as well. Three intermediate foot phalanges have compressed diaphyses with osteophytic growth on the proximal epiphyses. A right first distal foot phalanx has a significantly thickened diaphysis. None of these bones display evidence of trauma in the form of a fracture. Finally, two distal foot phalanges display evidence of trauma, as one is ankylosed to an intermediate phalanx and the other is misshapen with bone growth from the proximal epiphysis. Trauma is again observed on a left third and fourth metatarsal with large bone callous' affecting the articulation with the tarsals and other metatarsals.

There are several commingled bone contexts (B371, B404, B462, B463) within Tomb 228 which were not directly associated with the bonestack. Added to this is the material which was disturbed when the tomb was looted during excavation (B379) and it comes to account for 54 teeth and 232 bones or bone groups. Overall, preservation for this context is fair to poor, with variable levels of completeness and fragmentation and surface preservation is good to moderate. Dental pathologies affect at least two individuals within the commingled context. Nine teeth, representing at least two individuals, display supragingival calculus. As well, a left mandibular first premolar displays a carious lesion. Seven teeth are show heavy attrition into the tooth crown. There are three cases of ante-mortem tooth loss, affecting two maxillae, both of which have lost the left first molar and one mandible fragment which lost the right first molar *in vivo* and was still actively remodelling and porous at death.

Osteoarthritic changes once again are the most common pathology observed on the commingled bones. One thoracic and one lumbar vertebral body displays osteophytic growth on the anterior margin and a second lumbar vertebra shows osteophytic growth on the spinous process and inferior-posterior aspect of the lamina. The proximal articular facet of a left navicular shows osteophytic growth on the dorsal-lateral margin. Two proximal foot phalanges display bone growth on the epiphyses, one quite severely on the proximal and the other more minor on the distal epiphysis. As well, two distal foot phalanges exhibit small osteophytes on the proximal epiphysis and a distal first phalanx has osteophytes on the margins of the proximal epiphysis. None of these bones have any evidence of trauma. Trauma is observed on a left second metatarsal with an extensive callous which would have affected the third metatarsal. It seems quite plausible that this fractured bone likely belongs with the third and fourth left metatarsals from the bonestack (above) as all exhibit significant bone growth at the same area of the proximal end of the diaphysis. Fragments of a frontal bone display mild porotic lesions on the interior aspect which possibly represent a localized minor hematoma or infection. It does not seem to be wide reaching, affecting any other bones. However, as this was found within the commingled bones it is impossible to be certain, therefore the aetiology of this lesion is not possible to assess. As well, a left radius displays some bone growth along the posterior aspect of the tuberosity and a small, non-active lesion on the superior aspect of the proximal epiphysis which again may represent a localized trauma or infection, however there is no bone growth and it did does not appear to affect the articulation with the capitulum of the humerus.

Overall within Tomb 228, there is at least one adult individual who displays osteoarthritic changes of the vertebral column, though there are three individuals with osteophytic growth of the second cervical vertebra of the five recovered. At least two feet display osteoarthritic changes of a possible five feet based on the proximal foot phalanges, but with osteoarthritic changes affecting the proximal, intermediate and distal phalanges. Two individuals display osteoarthritic arthritic changes to the left ankle, affecting the left navicular of a possible four present. One proximal epiphysis of a left ulna was affected with porosity and extension of the articular facet of a possible four left proximal ulnae. At least two individuals of a possible five adults with dentition display calculus of the mandibular and maxillary teeth. At least two individuals display ante-mortem tooth loss, affecting the left maxilla. A minimum of one individual displays carious lesions as there is no duplication of teeth with caries. There are three cases of trauma, all of which affect the left metatarsals. It seems likely that, given the nature of the bone callous, all three of these metatarsals come from the same individual. Porosity was observed on one frontal bone of four recovered and one left proximal epiphysis of a left radius of four recovered. None of the subadult material displays any pathology.

<u>Tomb 229</u>

According to the excavation records, Tomb 229 status is looted with an intact base and contains one articulated individual, one cranium and one bonestack. The MNI for Tomb 229 is three adults and one child aged four to eight years at death. Surface preservation of the skeletal material is poor to moderate: chalky with some eroded areas. At least one adult individual is a probable male and the other skeletal material cannot be provided with a sex assessment. There are three teeth conclusively associated with the subadult. Skeleton B is an adult aged 22-28 years at death. Cranium A represents a probable male adult.

The North Bonestack (B426) contained a total of 42 teeth and bones or bone groups were examined. Surface preservation of the skeletal material is moderate to poor. Overall, 47.6% (n=20) of the skeletal material could not be assessed for pathologies. Three pathologies were observed, all of which are osteoarthritic changes to the bone. A left proximal first foot phalanx and a right distal first foot phalanx each display osteophytic growth at the proximal epiphysis. The sternal end of a right clavicle displays bone growth and what looks like a new wear facet on the inferior surface. There is no evidence of trauma for any of these bones.

There are a number of commingled bone contexts within Tomb 229 (B392, B426, B393). A total of 119 teeth and bones or bone groups were examined for the commingled context. Surface preservation of the commingled skeletal material is moderate to poor with 44.5% (n=53) of the commingled skeletal material which could not be assessed for pathologies. There were no pathologies observed on the bones or teeth. Four maxillary teeth display heavy attrition, wearing deeply into the crown.

Tomb 229 contains a very unusual inclusion of burned human bone (B417). This bone was examined for this study, but not included in the analysis as few interpretations regarding palaeopathology can be made. There were three bags of bone, with an overall weight around 150g, for which a partial inventory was created. Spiral fracturing of long bones with lots of variation in colour and texture from black to white was noted. A total of 24 bones were identified from this burnt context. No pathologies were observed. The MNI for the burned bone is one and this is not included with the overall MNI as the material is too fragmentary.

Overall for Tomb 229 there is minimal pathological expression. A total of three elements display osteoarthritic changes representing one individual. The only right clavicle identified displays bone growth which may represent a poor articulation with the manubrium, possibly related to the shoulder articulation. A right and left foot are affected of two possible feet present. Two individuals are display carious lesions based on the maxillary right first molars.

Tomb 235

According to excavation records, Tomb 235 contains five crania and commingled skeletal material. The MNI for Tomb 235 is three, based on multiple bones and age estimations of the material within the tomb. Surface preservation of the skeletal material is poor, predominately described as chalky and eroded and highly fragmented. Overall, 79.3% (n=82) of the skeletal material cannot be assessed for pathologies. Most likely there is one adult, a probable male along with one adolescent, aged 11 years +/- 30 months and a child aged six years+/- two years at death. The bones are highly fragmentary and there may be another gracile adult present. However, most of the bones representing another individual are so incomplete and fragmented it is possible that they are associated with other long bones. Cranium 1 represents a possible subadult. Cranium 2 represents an adult. Cranium 3 represents a possible subadult. Cranium 4 represents a subadult aged 11 years +/- 30 months at death. Cranium 5 represents a probable male adult.

The commingled material (B401, B402) is composed of 94 teeth and bones or bone groups. The preservation is quite poor, with high levels of fragmentation and very poor surface preservation, such that, 79.8% (n=75) of the skeletal material could not be assessed for pathologies. There were no conclusive pathologies observed on the bones or teeth.

Tomb 236

According to excavation records, Tomb 236 is largely looted with some intact burial contexts at the base of the tomb and contains one articulated individual. The MNI for Tomb 236 is one. Surface preservation of the skeletal material is quite poor. All of the skeletal material belongs to Skeleton A (labelled as 'Individual NM', B397, B418) which is most likely a subadult individual aged five to nine years at death.

Tomb 237

According to excavation records, Tomb 237 status is looted or intact but unsealed and highly disturbed by animals and contains one articulated individual, four crania and one bonestack. The MNI for Tomb 237 is five, with four adults and one subadult aged three to six years at death. Surface preservation of the skeletal material is poor. At least two of the adults are female. A left maxillary canine and a left mandibular lateral incisor possibly indicate a sixth individual was present. Skeleton E is a female aged 24-38 years at death. Cranium A represents a probable female aged 22-28 years at death. Cranium B represents an adult aged 20-32 years at death. Cranium C represents a very incomplete adult. Cranium D likely represents a subadult.

The bonestack (B452, B453) represents the largest context within Tomb 237. A total of 322 skeletal elements and bone groups were examined. Surface preservation is quite poor, highly fragmented with much of the bone surface described as chalky and eroded. Overall, 57.6% (n=196) of the skeletal material could not be assessed for pathologies. Only dental pathologies were observed on the bonestack skeletal material. A left mandibular central incisor displays mild supragingival calculus. A left and a right deciduous second mandibular molar each display a small carious lesion. Six permanent teeth display heavy attrition. Overall, the skeletal material within Tomb 237 does not exhibit much pathology. The only subadult individual present displays carious lesions. At least one adult of the four possibly present displays mild calculus and ante-mortem tooth loss. There is no evidence of postcranial pathologies on any of the bones.

Appendix F: Description of the discrete skeletons from Lemba-*Lakkous* settlement with particular reference to the pathology

**Note please that unless otherwise indicated, age estimation was based on molar wear (Miles 1963) or dental development (Ubelaker 1989) and sex assessment was almost solely based on cranial features (Buikstra and Ubelaker 1994). If the pelvic bones were present, sex was assessed based on them (Brooks and Suchey 1990; Phrenice 1969).

Overall, 47 discrete mortuary complexes with a minimum number (MNI) of 58 individuals were examined from the settlement site of Lemba-*Lakkous*. What follows is a grave by grave description of the discrete skeletons recovered and assessed with particular reference to any pathological lesion observed (for grave descriptions see Niklasson 1985:43-53, 134-149). The differences observed between the current analysis and the previous study of the human dentition by D.A. Lunt (1985) highlight a few important points. First, that perhaps it is beneficial for observers with different academic backgrounds to examine the material from different perspectives. Second, that access to radiographs can enhance the observers' ability to discuss age and pathologies of human osteological material. Thirdly, much more information can be acquired by looking at the entire individual rather than just a portion. And finally, is the importance of immediate access to material during excavation or soon after. Sadly, there are a number of missing elements from this current study, for which there is no reasonable explanation for their disappearance. It must be noted, that Lunt did not record for calculus accumulation, so where that is observed, invariably it will not have been recorded by Lunt (1985).

Area I

<u>Grave 2</u>

The remains of the child within Grave 2 (LL230) are aged five years +/-sixteen months at death. Surface preservation of the skeletal material is good to moderate with only mild taphonomic damage. However, the bones and teeth have all been consolidated with an unknown consolidant post excavation. Overall, the skeleton is approximately 35.0% complete, including 15.0% of the cranium. The left arm and shoulder are present, along with a femur, a tibia and some rib fragments and all the small bones of the hands and feet are missing. There were six deciduous and nine developing permanent teeth examined, of which only the left mandibular first molar and second premolar are in position. There is no evidence of dental disease and there were no pathologies observed on any of the bones. While the age estimation of this study is the same as Lunt's, she observes a hypoplastic line in a developing premolar which was not noted in this study (1985: 56).

Grave 3

The remains of the child within Grave 3 (LL439) are aged eight years +/- two years at death. Surface preservation of the skeletal material is moderate with some erosion and discolouration. The skeleton is fairly complete, with approximately 90.0%, including about 65.0% of the cranium. The main postcranial bones missing are the right scapula, left lower leg long bones and many small bones of the hands and feet. There were 37 teeth examined, including 12 deciduous and 25 developing permanent teeth, all of which were treated with consolidant. All the teeth are loose. There is no evidence of dental disease and there were no pathologies observed on any of the bones. Lunt records that 'the bone of the maxilla and of the right half of the mandible had disintegrated in the soil into small slivers, but the teeth were all in their correct positions in the ground and the jaws were in occlusion' (1985:56). Other observations by Lunt similarly reflect those of this study.

Grave 4

The remains of the child within Grave 4 (LL267) are aged three years +/- one year at death. Surface preservation of the skeletal material is moderate to poor with erosion and discolouration affecting most of the skeletal material. Overall, only a minimal amount of the skeleton was recovered, consisting primarily of 10.0% of the cranium, a small fragment of the mandible, the left leg long bones, the right femur and left clavicle. There were nine deciduous teeth and a maxillary and a mandibular developing first molar. It appears that the left half of the skeleton is better preserved and was recovered in greater quantity than the right side, with only four teeth and right femur conclusively representing the right side. The only pathology is a medium sized carious lesion in the occlusal aspect, distal-lingual half of the deciduous left mandibular first molar. Lunt's observations match those noted here (1985: 56).

Grave 5

The remains of the child within Grave 5 (LL266) are aged four years +/- one year at death. Surface preservation of the skeletal material is quite poor with erosion and discolouration affecting most of the recovered remains. Approximately 15.0% of the skeleton is present, including very little (5.0%) of a cranium, four highly fragmentary arm long bones and four highly fragmentary leg long bones, a vertebrae fragment and a clavicle. The developing permanent maxillary left central incisor is the only tooth examined. All the bones were treated with a consolidant. No pathologies were observed on any of the skeletal material. Lunt provides a short summation of the recovered dentition (1985: 56).

Grave 6

Skeleton A is a child aged two years +/- eight months at death. Tooth surface preservation is moderate with some pitting and taphonomic damage. Only the developing permanent left first molars from both the maxilla and the mandible represent this individual. There is no evidence of dental disease. This assessment agrees with Lunt (1985: 56).

Skeleton B is a child aged four years +/- one year at death. Tooth surface preservation is moderate with some pitting and taphonomic damage. This individual is represented solely by a mandible fragment with four erupted deciduous teeth and an un-erupted left central incisor in position and the two developing mandibular first permanent molars are loose. There is no evidence of dental disease. This assessment agrees with Lunt (1985:56).

Skeleton C is a child aged most likely between seven to eight years at death. Surface preservation of the teeth is moderate with some pitting. The assessment provided here for Skeleton C and D is based on the same divisions of dentition that Lunt determined. Skeleton C is represented by four developing permanent mandibular teeth: both second premolars and both lateral incisors. There is no evidence of dental disease.

Skeleton D is a child with an estimated age range of eight to nine years at death. Surface preservation of the teeth is moderate with some pitting. This individual is represented by four deciduous and six developing permanent maxillary teeth and six deciduous and six developing permanent mandibular teeth. All these teeth are loose and therefore it is possible that some of these teeth could belong to either Skeleton C or D. There is no evidence of dental disease. Both these assessments agree with Lunt's previous interpretation (1985: 56).

Grave 11

The adult individual recovered from Grave 11 (LL324) was articulated according to the grave plan (1985: fig.18). Surface preservation of the skeletal material is quite poor with most of the material eroded and discoloured. There are no molars present therefore it is only possible to state that there postcranial material from a skeletally mature adult represented approximately 30.0% of the skeleton. The long bones of both arms, three hand bones, several ribs, both femora and a heavily worn permanent right maxillary central incisor are present. Lunt records a single well worn incisor as well (1985: 56). There is no evidence of dental disease on the single tooth and there were no pathologies observed on the postcranial material.

Grave 19

Only postcranial remains of a possible infant were recovered from Grave 19 (LL346). Age assessment is based on the general size and stage of development of the bones. Surface preservation of the skeletal material is moderate with some erosion and discolouration. There are two fragments of calvarium, one cervical vertebra fragment and an indeterminate long bone recovered. The remains are highly fragmentary. There were no pathologies observed. This age assessment disagrees with Lunt's which states that the individual is most likely a child (1985: 56).

Grave 22

Grave 22 (LL438) contains the remains of at least one female adult, over the age of 21 years based on cranial traits and dental development. Surface preservation of the skeletal remains is predominately moderate with some erosion and discolouration. Approximately 40.0% of the skeleton is present including 60.0% of the cranium. One ulna, one scapula, most of the leg long bones, all thoracic and lumbar vertebrae, all the ribs, most of the hand and foot bones and most of the pelvic girdle are missing. There were eight maxillary teeth, six mandibular teeth and one indeterminate tooth examined, all of which are loose. The only pathologies observed on the postcranial material are osteoarthritic changes in the first and second cervical vertebrae. There is extension of the dens facet on the atlas inferiorly directed. There is possible extension of the dens at the apical ligament attachment, superiorly directed, though post-mortem damage makes the extent impossible to determine. There is no further evidence of pathologies on the bones.

Lunt’s description has aided in understanding the context and hence some of the pathological expression within the dentition. She notes that during the excavation of the cranium, a gap was noted between the second left mandibular molar and the second left mandibular premolar, perhaps indicating that left first mandibular molar was lost *in vivo* (1985:56). These regions do not survive anymore. Perhaps the loss of mandibular first molars was bilateral thus explaining the lack of wear on the maxillary right first molar. As well, Lunt states that the third left mandibular molar was almost completely destroyed by a dental caries (1985: 56). As she was able to examine the teeth in position, she could identify this as the third molar, whereas the loose root fragments were recorded as an indeterminate tooth fragment in the current study as there is not enough of the crown left to identify the tooth. The anterior maxillary teeth show heavy attrition which may be explained by the loss of the mandibular molars and the severity of the caries in the posterior dentition which would have put the load of mastication on these teeth. The mandibular anterior teeth are absent with the exception of the left canine. There are carious lesions on the maxillary left first premolar, the mandibular left second molar, the mandibular left second premolar and the mandibular right second molar. The severity of the caries on the mandibular second molars has exposed the pulp chamber and most likely would have resulted in infection and a possible dental abscess. Along with the dental disease, the maxillary right lateral incisor has an unusual morphology with two fused roots and variation crown morphology. This has been referred to in clinical dentistry as a supernumerary root and is quite rare (Khojastehpour and Khayat 2005).

Grave 23

Grave 23 (LL444) contains an adult female aged 18-26 years at death. Surface preservation of the skeletal material is moderate with some erosion and discolouration. Approximately 55.0% of the skeleton is present, including about 20.0% of the cranium. The remains of this individual are very fragmentary. Most body parts are represented bilaterally in small fragmentary amounts. The right ulna is the only missing arm long bone, while the legs are missing a femur and a tibia. As well, there are only very few hand and foot bones present and no carpals or tarsals, nor most of the thoracic and lumbar vertebrae and pelvic girdle. There were 13 maxillary, nine mandibular teeth and one indeterminate tooth examined, all of which are loose. The right maxillary second molar and the right mandibular second molar both display carious lesions of the crown. None of the other teeth display caries and there is no further evidence of dental disease. In regards to postcranial pathologies observed, the first cervical vertebrae shows superiorly directed bony extension of the dens articular facet. There is no evidence of trauma and this most likely represents a localized degenerative joint change as none of the other cervical vertebrae are affected. The proximal epiphysis of the left first proximal foot phalanx is remodelled with rough bone growth on the plantar surface, possibly indicating a minor trauma. A radiograph is required to ascertain if there was a fracture. (Please see Appendix G for more details about the context of this grave).

Grave 24

The child within Grave 24 (LL482) is aged four years +/- one year. Surface preservation of the skeletal material is quite poor with erosion and discolouration. Approximately 5.0% of the skeleton is present, including about 20.0% of the cranium, an indeterminate tibia and an indeterminate long bone. There were 17 maxillary and 13 mandibular teeth examined, all of which are loose. There is no evidence of dental disease and there were no pathologies observed on the bones. These observations agree with Lunt (1985: 57).

Grave 25

The individual within Grave 25 (LL483) is a probable female with a tentative age of 18-24 years at death, which is most likely artificially low due to the loss of the mandibular molars and using just the anterior teeth is unreliable (Lovejoy 1985). Thus, aging this individual is rather imprecise. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration. Approximately 75.0% of the skeleton was recovered with fairly high fragmentation, including about 60.0% of the cranium. Most body parts are bilaterally represented to some degree. There are some small bones of the hands and feet missing, in particular the tarsals and the pelvic girdle is very fragmentary and incomplete. There were 13 maxillary, seven mandibular teeth and one indeterminate tooth examined, of which the left mandibular lateral incisor and canine are in position. Dental disease seems to have affected this individual quite badly. All six mandibular molars are missing, indicating that either the molars were congenitally absent or all six molars were lost *in vivo* many years before death as the alveolar bone has completely resorbed. Radiographs are required to discuss this further. The maxillary molars which were examined show minimal wear. The maxillary left premolars are very heavily worn, which probably reflects the lack of molar occlusion. Interestingly, none of the five incisors examined display particularly heavy wear. The maxillary left second premolar also has a carious lesion on the distal surface at the cemento-enamel junction. The maxillary left canine displays a mild supragingival ridge of calculus on labial aspect of the tooth. The maxillary right canine and first premolar are also heavily worn, and both mandibular canines seem to have an unusual wear pattern on the labial aspect which appears to reflect a mal-occlusion. Lunt confirms the diagnosis of severe dental disease and records the missing dentition (1985:57).

In regards to pathologies on the bones, the right tibia appears to bow laterally in the middle third of the bone (best observed from the anterior perspective) and the medial half of the proximal epiphysis appears slightly remodelled on the posterior aspect. Unfortunately the left tibia was too fragmentary for comparison, the distal epiphysis of the right femur and none of the tarsals have been preserved and both fibulae are highly fragmented. Possible causes for this alteration to the tibia include: trauma, though there is no visible evidence of it on the bone or adjacent bones or it could be due to possible thinning of the cortical bone causing structural weakness due to a metabolic disorder, infectious or hematopoietic disease or vitamin or mineral deficiency. There is no evidence on any of the other long bones for a general physiological disease. The tuberosity of the left radius displays osteophytic growth along the posterior margin creating a small bony lip on the surface. The radial head is not preserved nor is the proximal half of the right radius. The left and right ulnae are highly fragmentary but don’t seem to display any changes and the distal epiphyses of both the humeri are not altered in anyway. Therefore, this may just represent a non-pathological bone growth due to use of the *biceps brachii* muscle. The right trapezoid has mild osteophytic extension of the dorsal capitate-scaphoid boundary which likely reflects a mild localised indication of wear and tear as there are no changes observed in the other two right carpals and there is no left trapezoid for comparison. Two cervical and eight thoracic vertebrae display osteoarthritic changes to the margins of the body. All have mild osteophytic growth along the margins of the body and four of the thoracic vertebrae display some porosity in the spongy interior bone of the body. As there is no evidence of trauma in the skeleton, this most likely reflects general osteoarthritic changes to the spine. The bodies of the lumbar vertebrae are not well enough preserved to allow for assessment. There were no other pathologies observed on the bones.

Grave 30

The individual within Grave 30 (LL1033) is a male aged 30-42 years at death. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration. Approximately 80.0% of the skeleton is present, including about 80.0% of the cranium. All body parts are represented bilaterally to some degree. However, almost all are fragmentary and incomplete. The right os coxa and some of the hand and foot bones are missing. There were 12 maxillary and nine mandibular permanent teeth examined of which there are four maxillary teeth in position. There are two carious lesions, a small one in the occlusal surface of the left second maxillary molar and the heavy wear of the left first maxillary molar seems to stem from a caries in the occlusal surface. Heavy attrition is observed on three of the teeth, the two maxillary first molars and second left maxillary premolar, which reflects the advanced age of the individual. The heavy wear on the first molars is not reflected in the anterior teeth. The mandibular right second and third molars both have a mild ridge of supragingival calculus. Finally, the maxillary canines display a mild LEH in the cervical third of the crown reflecting a period of physiological stress in childhood as the tooth was forming, the mandibular left canine does not display any defect. There is disparity in the assessment of pathologies of the dentition as Lunt states that ‘there is no evidence of dental caries’ (1985:57).

In regards to pathologies on the bones, osteoarthritic changes are observed on several joints. Both shoulders seem to have been affected by osteoarthritic changes as both scapulae display osteophytic growth on the margins of the glenoid and the acromial ends of the clavicles display porous new bone growth. The left scapula also exhibits extension of the acromion with porous new bone growth and a new wear facet on the anterior-superior aspect. The atlas displays osteophytic growth on the articular facet for the dens and the superior aspect of the dens of the axis has a small bone growth. The only thoracic vertebra recovered displays osteoarthritic changes, affecting the superior facets. There were no pathologies observed on the lumbar vertebrae and there is no evidence of trauma. A distal hand phalanx had a bony growth on the dorsal margin of the proximal epiphysis which may represent trauma that is in the process of healing as there is some separation of a bone fragment from the main diaphysis with new bone growth. Finally, there is evidence of a possible chronic sinus infection, as the sinus in the frontal bone between the orbits appears enlarged with small patches of new woven bone. There is no evidence of trauma and only a portion of the frontal bone is present, making assessment of the other sinus cavities impossible. There were no other pathologies observed.

Grave 31

The infant within Grave 31 (LL1034) is aged birth +/- 2 months. Surface preservation of the skeletal material is predominately moderate with erosion and discolouration affecting most of the material. Approximately 25.0% of the skeleton is present, including about 15.0% of the cranium. Both ulnae were not recovered, nor were: both femora and one fibula, most of the small bones of the hands and all the bones of the foot and the pelvic girdle and all vertebrae. There were four maxillary and five mandibular developing deciduous teeth examined, however, the preservation level of the teeth was so poor that they could not be assessed. This assessment agrees with Lunt's synopsis (1985: 57). There were no pathologies observed on the bones.

Grave 35

The individual within Grave 35 (LL1038) is an adult female aged 20-52 years at death. Surface preservation of the skeletal remains is moderate with some erosion and discolouration. There is a wide variation in tooth wear and hence age range estimation due to ante-mortem tooth loss. Approximately 85.0% of the skeleton is present, including about 75.0% of the cranium. All body parts are represented bilaterally to some degree, with only minimal vertebrae, os coxae and tarsals and carpals present. There were 16 maxillary and 14 mandibular teeth examined, of which both mandibular third molars are in position and all the rest of the teeth are loose. Both mandibular second molars have been lost *in vivo* at relatively the same time as the state of alveolar bone resorption is comparable and almost inactive with only a mild residual porosity. Lunt notes this and also allows that it is possibly periodontal disease which has caused the loss of the molars (1985:57). Six of the 30 teeth have mild to severe supragingival calculus ridges on various aspects of the teeth. All of the teeth displaying calculus are from the maxilla, barring the left mandibular third molar. Both maxillary first molars, second premolars, the right first premolar and the left mandibular first molar are heavily worn, likely due to the loss of the second mandibular molars, putting the load of mastication on these other posterior teeth.

Two bones display osteoarthritic changes. The atlas vertebra at the dens articular facet displays extension and mild remodelling of the facet. None of the other cervical vertebrae fragments recovered display any osteoarthritic changes and there is no sign of trauma. The axis was not recovered. The right capitate displays extension and bone growth of the articular facet with the third metacarpal. Neither of the other two right carpals recovered exhibits any changes and the left capitate is not present, nor is the proximal epiphysis of the third right metacarpal. There is no evidence of trauma and none of the other bones present display any pathological changes.

Grave 36

The infant within Grave 36 (LL1039) is nine months +/- three months at death based on dental development. Surface preservation of the skeletal material is moderate to poor with all the bones and teeth eroded and discoloured. Approximately 30-35.0% of the skeleton is present, including about 60.0% of the cranium. All limbs are missing one or more long bone, there are almost no vertebra or hand and wrist or foot and ankle bones and no fragments of os coxae. The cranium is still within the grave soil and the remains are highly fragmentary. There were three deciduous and seven developing permanent teeth examined, of which only the left first permanent mandibular molar is in position within its crypt. Lunt's assessment is similar to the one provided here and she includes a note about aging, stating that the permanent dentition are developmentally slightly ahead of the deciduous teeth (1985:58). There is no evidence of dental disease and there were no pathologies observed.

Grave 39

The infant within Grave 39 (LL1042) is nine months +/- three months at death. Surface preservation of the bones is quite good with minimal taphonomic damage. However, the teeth are in very poor condition. Approximately 20.0% of the skeleton is present, including about 20.0% of the cranium. The cranium is still within the dirt it was excavated with and will require further cleaning. Only minimal postcranial bone is present, including the first cervical vertebra, indeterminate vertebrae fragments, a radius, the right leg long bones, three metacarpals and two hand phalanges. There were 15 deciduous and five developing permanent teeth were examined, all of which are loose. There is no evidence of dental disease and there were no pathologies observed on the bones. Again Lunt's assessment concurs with these observations, and again notes that the permanent dentition seem to develop slightly more quickly than the deciduous teeth (1985:58).

Grave 43

The adolescent within Grave 43 (LL1045) is aged fifteen years +/- three years at death, and is a possible male but due to the young age of the individual it is inconclusive. Surface preservation of the skeletal material is predominately moderate and several elements which are consolidated and obscured. Approximately 80.0% of the skeleton is present, including about 80.0% of the cranium. The cranium has been partially restored but has re-broken in some areas. Most of the body parts are represented bilaterally to some degree including all the long bones, ribs and vertebrae. There are only minimal fragmentary remains of the pelvic girdle and most of the bones of the hands/wrists and feet/ankles are missing. There were 16 maxillary and 16 mandibular permanent teeth, most of which are in position and fully erupted. The deciduous right maxillary canine has been retained which has retarded the eruption of the permanent maxillary right canine which is still within its crypt, while the permanent maxillary left canine has erupted. The third molars are still within their crypts. There is no evidence of dental disease and there were no pathologies observed on the bones. Lunt was able to radiograph the mandible and therefore provide a more precise age estimation, which matches the one determined by this observer (1985: 58).

Grave 45

The infant within Grave 45 (LL1047) is two years +/- eight months at death. Surface preservation of the skeletal material is good to moderate with only some of the material displaying some erosion and discolouration. Approximately 75.0% of the skeleton is present, including approximately 40.0% of the cranium. None of the feet/ankle bones are present and only very few hand/wrist bones. The pelvic girdle is also missing, as are the majority of the ribs. There were 20 deciduous and 12 developing permanent teeth examined. This assessment agrees with Lunt’s observations (1985:58). The only pathology observed is several small patches of porosity on the exterior surface of the right parietal. As the frontal orbits do not survive and there is no further evidence of porosity on any of the other cranial fragments, nor on any of the long bones, it must be assumed that this represents a localized pathology. While there is no evidence of trauma observed, this may reflect a minor traumatic incident, as well, a metabolic disorder, hematopoietic disease or vitamin or mineral deficiency cannot be ruled out either, despite the lack of evidence on any of the other bones. There is no evidence of dental disease and there were no further pathologies observed on the bone.

Grave 54

The infant within Grave 54 (LL1330) is three to nine months at death. Surface preservation of the skeletal material is moderate with some erosion and discolouration. Approximately 55.0% of the skeleton is present, including about 45.0% of the cranium. Almost all of the hands/wrist and feet/ankle bones are missing, as is the majority of the pelvic girdle both scapulae and the left femur. Only the deciduous left maxillary second molar and the deciduous right mandibular first molar are present and loose. There is no evidence of dental disease and there were no pathologies observed on the bones. This skeleton was not included in Lunt’s inventory.

Area II

Grave 7

The child within Grave 7 (LL77) is ten to twelve years at death. Surface preservation of the skeletal material is moderate to poor with many elements displaying some erosion and discolouration, and several bones consolidated and obscured.

Approximately 55.0% of the skeleton is present, including about 25.0% of the cranium. Most body parts are represented bilaterally to some extent, however both ulnae, one leg limb, most of the hand/wrist and foot/ankle bones are missing, as is much of the spinal column and pelvic girdle. There are 16 permanent and two retained deciduous teeth recovered, with nine in position in the mandible and two in position in the maxilla. The surface preservation of the dentition was so poor that none of the teeth could be assessed for pathologies. The mandibular second molar shows developmental defects in the form of very deep fissures leading to a hole on the occlusal surface. According to Lunt, when the mandible was radiographed she was able to observe that the second premolars were congenitally absent as were the third molars (1985: 150). Due to the failed formation of the second premolars the individual has retained the deciduous second molars which will at some point fall out leaving a gap in the dentition. Lunt also notes that the maxillary right canine is not in the correct position (1985: 150). The maxillary right canine appears to have been lost since her observations as there was none within the sample observed. However, it was noted that the maxillary right lateral incisor is out of position, which is in direct correlation to the movement of the canine. There is no evidence for pathologies on the bones.

<u>Grave 9</u>

The majority of the bones within Grave 9 (LL308) belong to a probable female adult (based solely on the volume of the left mastoid process and the gracility of two leg long bones). Surface preservation of the skeletal material is moderate to poor with erosion and discolouration of all the bones. Approximately 15.0% of the skeleton is present, including about 20.0% of the cranium. Besides the cranial fragments, the second cervical vertebra, minimal cervical vertebrae fragments, a humerus, a few hand bones, the right femur, two tibiae and a fibula were examined. Only one very poorly preserved indeterminate permanent mandibular molar was recovered. There are two intrusive perinatal tibiae present as well. Lunt examined and discusses twenty loose teeth which were recovered from this context. However, this dentition could not be located for the current study (1985: 150). She states that due to the slight degree of attrition, the individual is likely a male c. 20-25 years of age at death, and that there were two severe caries observed (1985: 150). There were no pathologies observed.

Grave 10

Skeleton A (LL317) is an infant aged two years +/- eight months at death based on dental development. Surface preservation of the bones is moderate with some erosion and discolouration, however the surface preservation of the teeth is very poor. Approximately 5-10.0% of the skeleton is present, including about 20.0% of the cranium. All of the bones are in a fairly fragmentary state. The only postcranial bones present are: the left humerus, the right femur and tibia and an unsided tibia. Portions of both the mandible and maxilla are preserved with dentition in position. There were five maxillary deciduous teeth plus the developing permanent left maxillary central incisor and four mandibular deciduous teeth plus the developing right permanent first molar examined. Both permanent teeth are developing within their crypts. None of the teeth could be assessed for pathologies. These observations agree with Lunt (1985: 150). There were no pathologies observed on the bones.

Skeleton B (LL317) is a child aged three years +/- one year at death (based on postcranial material and three teeth) Surface preservation of the skeletal material is predominately moderate. Skeleton B is represented by several duplicate cranial bones, a fragment of humerus and a fragment of mandibular bone as well as the deciduous right maxillary first incisor, the deciduous right mandibular second molar and the forming permanent first right mandibular molar. These observations agree with Lunt's assessment (1985: 150). There were no pathologies observed on any of the skeletal material.

Grave 12

The child within Grave 12 (LL327) is seven years +/- two years at death. Surface preservation of the skeletal material is good to moderate with many bones displaying only mild taphonomic damage. Approximately 75.0% of the skeleton is present, including about 55.0% of the cranium. Most of the body parts are represented bilaterally to some degree, with the right humerus and ulna missing, along with the left fibula, several thoracic and lumbar vertebrae, hand and wrist and foot and ankle bones and most of the pelvic girdle. There were five deciduous and 12 developing permanent maxillary teeth and eight deciduous and 14 developing permanent mandibular teeth and one indeterminate tooth examined, of which seven permanent mandibular teeth are in position. There is no evidence of dental disease. Lunt's assessment more or less concurs with the observations here regarding the dentition, however she only has record of 30 teeth, which means ten were recovered during assessment of the postcranial material (1985: 151). There were no pathologies observed on the bones.

Grave 13

The child within Grave 13 (LL328) is five years +/- sixteen months at death. Surface preservation of the bones is predominately moderate with some erosion and discolouration. However, the teeth are in very poor condition. Approximately 5.0% of the skeleton is present, including about 10.0% of the cranium. The only other bones preserved include, a few ribs and vertebrae and indeterminate long bones. There were four permanent, two deciduous teeth and one indeterminate incisor examined. All of the teeth are loose, with four from the maxilla and three from the mandible. The state of surface preservation of the dentition is so poor that pathologies could not be assessed. The only pathology observed is cribra orbitalia, a severe porosity of the superior aspect of the left orbit of the frontal bone. There are only very minimal calvarial fragments recovered, however there was no porosity observed on any of them. There is no evidence of trauma or cortical thinning of the long bones. Several metabolic disorders, hematopoietic diseases or vitamin or mineral deficiencies could be responsible for the porosity. However, as most of the skeleton was not recovered, it is impossible to determine the aetiology of this porosity. This age estimation for the current study is older than the one of c.2-3 years which Lunt provides (1985: 151). However, given the poor state of the teeth, discrepancy is not surprising. There were no pathologies observed on the other fragmentary bones.

Grave 14

Grave 14 (LL329) contains the remains of a perinatal infant which most likely died within a month after birth. Surface preservation of the bones is moderate however highly fragmentary. The only skeletal material which was recovered from this context is very fragmentary cranial bones and an indeterminate long bone. No pathologies were observed on any of the bones. There were no teeth present to allow for a more precise age at death estimation. Lunt estimates that this individual was ‘in the first year of life’ (1985: 151).

Grave 15

Grave 15 (LL330) contains the few fragmentary remains of an infant aged six months +/- three months at death, based on a crypt in the mandible fragment. Surface preservation of the skeletal material is moderate with some erosion and discolouration. This agrees with Lunt's age estimation of around nine months based on the mandible fragment (1985: 151). Approximately 5.0% of the skeleton is present. Only fragments of the cranium, mandible and os coxa were recovered in a highly fragmentary state. No pathologies were observed. There were no teeth examined.

Grave 16

Skeleton A (LL331) is estimated to be four to six years at death, based on dental development and size and stages of development of various postcranial elements. Surface preservation of the bones is good to moderate with some erosion and discolouration, however surface preservation of the teeth is very poor. Approximately 25.0% of the skeleton is present, including about 60.0% of the cranium. Only one set of arm long bones and one set of leg long bones are present, along with minimal vertebrae, a few hand bones, a few rib fragments and a sacral fragment. There were four deciduous maxillary teeth and a developing first mandibular and first maxillary molar examined for this individual. The newly erupted permanent maxillary first molar displays two small carious lesions on the occlusal aspect of the crown. There were no pathologies observed on the bones.

Skeleton B (LL331) is represented solely by three teeth: the maxillary left central incisor, the mandibular right central incisor and the mandibular left first molar. The estimated age of this second individual is eight to nine years at death. Surface preservation of the dentition is very poor, such that only one tooth could be assessed for pathologies. There is no evidence of dental disease.

Grave 17 (= Grave 8 Skeleton A and B)

Grave 8/17 Skeleton A (LL338) is most likely an adult. The remains come from the disturbed burial within the upper pit. Surface preservation was poor, eroded and discoloured. There are only minimal remains present, consisting of indeterminate long bone fragments and two hand phalanges. From this material, age and sex determinations are not possible. Only the distal hand phalanx could be assessed for pathologies, none were noted. As there are no teeth, this individual is not included in Lunt's discussion (1985: 150).

Grave 8/17 Skeleton B (LL229) is an infant aged six months +/- three months at death. This burial is also from the disturbed burial within the upper pit. Surface preservation of the skeletal material is moderate to poor with erosion and discolouration affecting most of the bones. Skeleton B is in better preservation than Skeleton A, with both cranial and postcranial elements preserved, including dentition. Approximately 35.0% of the skeleton is present, including 30.0% of the cranium. The arm long bones are mostly present as are the leg long bones. The majority of the rest of the skeleton is absent, with only minimal cervical vertebrae, ribs and os coxae present. There were five mandibular developing deciduous teeth examined. There is no evidence of dental disease and there were no pathologies observed on the bones. These observations are similar to Lunt's, her age estimation is slightly older (c 9 months to one year) however she discusses two possible infants which are not represented by the dentition or the postcranial bones (1985: 150).

Grave 17 Skeleton C (LL332) is an infant aged two years +/- eight months. These remains came from the lower pit of the burial structure. Surface preservation of the skeletal material is moderate with some erosion and discolouration. Approximately 20.0% of the skeleton is present, including about 70.0% of the cranium. Only the left clavicle is present from the upper limbs, along with very minimal cervical and thoracic vertebrae, rib fragments, the left femur, both tibiae and fibulae and only two metacarpals. There were eight maxillary and four mandibular deciduous teeth examined, all of which are in position. There is no evidence of dental disease. Moderate to severe porosity of the superior aspects of both frontal orbits was observed. None of the other cranial fragments display any porosity, nor do any of the postcranial bones. There are a number of causes for porosity in the orbits including metabolic disorders or hematopoietic diseases. As there are no other lesions recorded on the bones or teeth, it is unclear what may have caused this porosity. Lunt records a possible infection site in the hard palate of the maxilla, with a possible fistula (1985: 151). This lesion was not observed during this most recent examination. There is no further evidence of pathology on the bones.

Grave 18

The adolescent within Grave 18 (LL1030) has an estimated age of 14-18 years at death. Surface preservation of the skeletal material is moderate to poor with all bones displaying some erosion and discolouration. There was some discrepancy between the dentition in regards to wear and development. However, when the postcranial material and fusion rates are taken into consideration a more precise age assessment is possible. This age estimation agrees with Lunt's conclusions (1985: 151). Approximately 50.0% of the skeleton is present, including 15.0% of the cranium. There are two humeri, radii, scapulae and tibiae present, along with an ulna, a clavicle, a femur, a fibula and one rib fragment present. Most of the foot/ankle and hand/wrist bones are missing, as is the pelvic girdle, vertebrae and almost all the ribs. The bones are highly fragmentary. There were 18 permanent teeth and one deciduous and one indeterminate tooth examined, all of which are loose. Four are from the maxillae and 15 are from the mandible. The deciduous left second mandibular molar is retained and thus quite heavily worn and has mostly resorbed roots. Lunt suggests that the resorbed roots indicate that the second premolar was either congenitally absent or deeply embedded (1985: 151). There were no pathologies observed on either the bones or the teeth.

Grave 26

The adult within Grave 26 (LL550) is a male aged 36-48 years at death. Surface preservation of the skeletal material is moderate with some erosion and discolouration, but overall, the postcranial bone is quite will preserved with minimal fragmentation. Due to extensive dental disease and the fact that the dentition was treated with a consolidant which has in some cases adhered dirt to the surface, the age estimation was quite difficult. Approximately 85.0% of the skeleton is present, including 75.0% of the cranium. Most body parts are represented bilaterally to some degree, with only minimal remains of the pelvic girdle, hand and wrist and foot and ankle bones and lumbar vertebrae. There were 12 maxillary and 13 mandibular permanent teeth examined, of which two mandibular and three maxillary teeth are in position. Lunt records a total of 26 permanent teeth, but only 25 were located for this study (1985: 151).

This individual shows rather extensive dental disease. All the dentition shows very heavy wear with dentine extensively exposed and an unusual pattern of attrition, particularly noticeable on the molars, likely due to the dental disease. It seems likely that the missing tooth is a molar as Lunt records four with caries (1985: 151), while the current observations only include three molars with possible carious lesions. The maxillary left first molar has two large caries in the distal half of the crown and the crowns of both mandibular first molars have been destroyed by carious lesions and the resulting wear. The mandibular left second molar was lost *in vivo*. Mild supragingival calculus ridges were observed on the labial aspect of the left maxillary central incisor and lingual aspect of the left central mandibular incisor. This extensive dental disease and heavy wear would invariably have had an impact on this individual's health as the caries into the dental pulp would have likely resulted in infections. Lunt records a dental abscess in the alveolar bone below a molar affected by a severe caries (1985: 151). The mandible appears quite gracile in comparison to the rest of the skeletal elements, which may reflect a long period of disuse due to pain from mastication.

A number of the postcranial skeletal material display pathologies related to osteoarthritic changes. The spinal column has been affected by osteoarthritic changes particularly in the thoracic region where four of the sixteen recovered fragments have extension and remodelling of the superior and inferior articular facets. One indeterminate vertebral body fragment has osteophytes on the anterior margin. The lumbar vertebrae are not preserved and so cannot be compared to the osteoarthritic changes of the thoracic vertebrae. The dens of the axis has severe osteophytic growth on the superior aspect, projecting superiorly and towards the anterior, with areas of porosity. The dens articular facet of the atlas is not preserved. Several ribs display bony growth extension of the articular facets and one rib shows bone growth extension of the caudal margin. The number of the vertebrae and ribs affected is impossible to ascertain as the bones are highly fragmentary and there are so many fragments missing post-mortem.

There is bilateral expression of possible osteoarthritic changes to the radial tuberosity of both radii recovered for this individual. This appears as osteophytic growth along the posterior margin of the radial tuberosity and extension of the tuberosity toward the posterior. This bone growth may also represent non-pathological accentuation of the insertion of the *biceps brachii* muscle. There is new woven, porous bone growth within the olecranon fossa of the left humerus, though the extent of the pathology is difficult to assess due to post-mortem damage. There are no pathologies observed on the distal epiphysis of the right humerus nor do either ulnae display any changes, however both are missing their proximal and distal epiphyses. Both scapulae display osteophytic growth projecting laterally around the margins of the glenoid surfaces, indicating a possible poor articulation at the shoulder joint. The left scapula also displays some new bone growth under the coracoid which is long and tubular, perhaps reflecting a need to reinforce the coracoid due to changes in the pressures exerted on the bone from articulation. The right clavicle displays new bone growth on the sternal end, with the possible formation of a new articular surface. Overall, this individual displays bilateral osteroarthritic changes to the elbow and shoulder joints. When this is coupled with the osteoarthritic changes observed on the spinal column and ribs, it appears that this person may have suffered in general from osteoarthritis, as none of the bones observed display any evidence of trauma. None of the articular surfaces of the long bones of the leg or the os coxae are preserved to observe the extent of the osteoarthritic changes to all the joints of this individual. There are very few epiphyses preserved in general for this individual.

Grave 29

The adult within Grave 29 (LL1032) is a female aged 20-24 years at death based on dental wear. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration, however many of the teeth are in very poor condition. Approximately 10.0% of the skeleton is present, including about 35.0% of the cranium. There were no long bones recovered, with the exception of a small femoral fragment. There are some small bones of the hands and feet remaining, as well as a few ribs and vertebrae fragments, the scapulae and clavicles. According to the grave plan within the publication, this individual is rather complete (1985: fig.38). Fragmentation levels vary considerably throughout the remaining bones. There were 15 maxillary and ten mandibular teeth examined, all of which are loose. The roots of the molars have a very unusual morphology and appear somewhat malformed though complete. The mandibular right second molar has a rather large caries in the occlusal aspect. The mandibular left canine has a mild linear enamel hypoplasia in the cervical third of the tooth, likely representing a localized stress as it is not present on the right canine. The maxillary right third molar has a mild supragingival ridge of calculus just at the cemento-enamel junction. It is possible that there are further dental pathologies present on the teeth, however taphonomic damage has either erased the evidence or made it impossible to observe as 72.0% of the teeth could not be assessed for pathologies. In agreement with these observations, Lunt records that there are 25 teeth present with severe post-mortem taphonomic damage (1985: 152). There were no pathologies observed on the bones.

Grave 32

The adolescent within Grave 32 (LL1035) is a possible female (inconclusive based on age estimation) aged 12 years +/- 30 months at death. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration. Approximately 80.0% of the skeleton is present, including about 85.0% of the cranium. The right scapula and most of the hand/wrist and foot/ankle bones are missing post-mortem. There were 14 maxillary and 13 mandibular permanent teeth examined, all of which are in position. The very deep furrows on the mandibular right second molar may harbour the beginnings of a carious lesion. There were no pathologies observed on the teeth. This age assessment agrees with Lunt, though apparently one tooth has been lost between studies as she records 14 maxillary and 14 mandibular teeth (1985: 152). According to Lunt, the radiograph confirms that the third molars are congenitally absent. The only pathology observed is found in both orbits of the frontal bone in the form of mild cribra orbitalia. This porosity is not observed on any of the other cranial fragments, nor is there porosity or cortical thinning of the long bones. Porosity in the orbits can have a number of causes including metabolic disorders, hematopoietic disease or vitamin or mineral deficiencies. As there is no further evidence of pathology on any of the other bones, it is impossible to determine the cause of the porosity.

Grave 33

The adolescent within Grave 33 (LL1036) is aged 12-18 years at death. Surface preservation of the skeletal material is predominately good to moderate with minimal taphonomic damage, except for the small bones of the feet which are consolidated together, obscuring their surfaces. Approximately 85.0% of the skeleton is present, including a very well preserved cranium (c.90.0%) which has been restored. Almost all body parts are represented bilaterally with all of the long bones except a tibia and fibula present. As well, most of the os coxae, some small bones of the hands/wrists and feet/ankles, ribs, vertebrae, both scapulae and clavicles were not recovered. The upper half of the skeleton is better preserved than the lower half. There were 14 maxillary and 15 mandibular teeth, with one indeterminate tooth root. Just over half the teeth are in position, mainly in the mandible as the maxillae are highly fragmentary. The dentition displays a number of pathologies. The left first mandibular molar was lost *in vivo* and is almost completely resorbed with some pocking on the site of tooth loss. While the surfaces of the mandible and the dentition are fairly well preserved and the roots of many teeth are in position, some of the teeth are broken at the cemento-enamel junction post-mortem. Of the 30 teeth examined for this study, only five could not be assessed for pathologies. Lunt records four teeth with carious lesions (1985: 152). In the current assessment, only the second mandibular molars appear to have caries. There are two teeth in position where the crown is missing which may reflect crown loss due to caries and none of the teeth seem to have the large lesions described by Lunt (1985: 152). Both mandibular canines and both central maxillary incisors display mild LEH in the middle third and cervical third, respectively, of the crown. There is mild supragingival calculus on the right mandibular central and lateral incisors, which is not observed on the left mandibular central incisor and the left lateral incisor is missing its crown. The only postcranial pathologies observed affect the atlas and axis, with extension of the articular facet with the dens, inferiorly directed on the atlas and a small osteophyte on the superior aspect of the dens of the axis. This individual seems quite young to display osteoarthritic change. There are no other pathologies recorded on the bones.

<u>Grave 34</u>

The infant within Grave 34 (LL1034) is aged one year +/- four months. Surface preservation of the bones is moderate with some erosion and discolouration. However, the preservation of the teeth is very poor. Approximately 10.0% of the skeleton is present, including about 15.0% of the cranium, a few cervical vertebrae, several ribs, a left ulna and a hand phalanx. There were 16 deciduous and nine permanent teeth examined, all of which are loose. Surface preservation of the dentition is so poor that 76.0% of the teeth could not be assessed for pathology. The only pathological lesion noted is on a left parietal fragment, which displays porosity and new woven bone on the external surface near the saggittal-lambdoidal suture junction. Of the few cranial fragments present, none display any porosity and there is no porosity observed on any of the postcranial bone. There are several reasons of porosity and woven bone growth on the parietal, including trauma, metabolic disorders or hematopoietic diseases. However, given the localised nature and the woven bone, a periosteal hematoma seems most likely causing new bone growth on the surface of the bone. There is no evidence of dental disease and there were no other pathologies observed on the bones. The observations regarding the age estimation and lack of pathologies agree with Lunt's assessment (1985: 152).

Grave 37

The adult within Grave 37 (LL1040) is a probable female aged 20-35 years at death. Surface preservation of the bones is moderate. However, the preservation of the teeth is very poor. Aging is complicated by the wear pattern of the dentition as the anterior teeth are much more worn than the molars. There are no postcranial bones present. Approximately 70.0% of the cranium is preserved, along with fragments of the mandible and eight maxillary and 12 mandibular permanent teeth. The surface preservation of the dentition is so poor that it is was not possible to assess for most pathologies. However given the nature of dental caries, there was one case that they could be observed. There are two small caries on the occlusal aspect of the mandibular right third molar. This is the only evidence of pathology on the skeletal remains present. This observation disagrees with Lunt's conclusion that there were no caries present (1985: 152).

Grave 38

Grave 38 (LL1041) contains the remains of at least one infant. The surface preservation of the bones is moderate. However, the teeth are in very poor condition. The estimated age of the infant is six months +/- three months at death. This age estimation agrees with Lunt (1985:152). Approximately 3.0% of the cranium is present with only the left temporal, indeterminate calvarial fragments, three deciduous teeth and one indeterminate tooth crown fragment present. There is no postcranial material. There were no pathologies observed.

Grave 40

The adult within Grave 40 (LL1043) is tentatively aged 30-38 years at death using only the anterior teeth (Lovejoy 1985). It is not possible to assess sex. Surface preservation of the bones is predominately moderate with some erosion and discolouration. However, the teeth are in fairly poor condition. Approximately 20.0% of the skeleton is present, including about 20.0% of the cranium. Only a very small number of postcranial remains were recovered from within this context, including two humeri, a radius, an ulna, a scapula and a clavicle fragment, a few hand bones, a femur fragment and several ribs. All other postcranial bones are absent. There were six maxillary and five mandibular teeth examined, plus three indeterminate tooth fragments and a supernumerary peg-shaped tooth, all of which are loose. Lunt's description of the dentition accurately reflects the issues with the current study's assessment, 'the teeth have been affected by severe post-mortem erosion and are difficult to identify' (1985: 152). It is impossible to know where in the jaw the supernumerary peg-shaped tooth occurred as neither the maxillary nor mandibular alveoli is present. There were no pathologies observed on the bones or teeth.

Grave 41

The child within Grave 41 (LL1044) is six to ten years of age at death. Surface preservation of the bones is mostly moderate however the dentition is in very poor condition. Approximately 5.0% of the skeleton is present. The bones recovered consist of cranial elements, an indeterminate humerus and an indeterminate long bone. There were eight deciduous and 20 permanent teeth examined, all of which are loose. All the bone material is in a very fragmentary state and could not be assessed for pathologies. The surface preservation levels of the dentition were so poor that only the right mandibular second molar could be assessed for pathologies. There were no pathologies observed. This agrees with Lunt's assessment (1985:152).

Grave 44

The child within Grave 44 (LL1046) is four to eight years of age at death. Surface preservation of the bones is moderate with some erosion and discolouration. However, preservation of the teeth is moderate to poor. Approximately 40.0% of the skeleton is present, including about 65.0% of the cranium. One radius, one ulna, one clavicle, one fibula, both scapulae and the hand/wrist and foot/ankle bones are completely absent.

The thoracic and lumbar vertebrae are not represented and there are only minimal fragments of the pelvic girdle and ribs present. As Lunt also observed, the full set of deciduous dentition is present, the first permanent molars have erupted and much of the permanent dentition is developing within the bony crypts of the jaws (1985: 152). There were 20 deciduous and 15 developing permanent teeth examined, of which 60.0% could not be assessed for pathologies due to very poor surface preservation. Almost all the mandibular teeth are in position as are the right maxillary teeth. There is no evidence of dental disease and there were no pathologies observed on the bones.

Grave 46

The child within Grave 46 (LL1156) is aged five years +/- sixteen months at death. Surface preservation of the bones is moderate with some erosion and discolouration, while preservation of the teeth is moderate to poor. Approximately 15.0% of the skeleton is present, including 75.0% of the cranium. Only a minimal amount of postcranial remains are present including: a right humerus, an ulna, a right scapula, two clavicles, a few cervical vertebrae, rib fragments, mandible fragments and a femoral fragment. There were 14 deciduous and six permanent teeth examined, of which all but two are in position. This child suffered from dental disease, in the form of a severe carious lesion on the deciduous mandibular second molar which has resulted in the formation of a large abscess at the apical end of the tooth. Lunt has arrived at the same conclusion (1985: 153). This has apparently delayed or destroyed the developing second premolar below. There is no further evidence of dental disease on any of the other teeth and there were no pathologies conclusively observed on the bones.

Grave 47

The child within Grave 47 (LL1146) is aged two to four years at death. Surface preservation of the skeletal material is predominately moderate, with the exception of the cranium which is concreted with dirt and cannot be assessed. Approximately 20.0% of the skeleton is preserved, including about 50.0% of the cranium. The postcranial bones present include: the atlas and axis with a few cervical vertebrae, both humeri, a radius, an ulna, both femora, a left tibia, a fibula and a few rib fragments. There were 16 deciduous and seven developing permanent teeth examined, of which all but five mandibular teeth are loose. The discussion of the child within this grave agrees with Lunt, though her age estimation is slightly younger (c. 1-2 years) (1985: 153). There is no evidence of dental disease and there were no pathologies observed on the bones.

Grave 48

Grave 48 (LL1147) contains the remains of an adolescent with an estimated age of 14-20 years at death. Surface preservation of the teeth is fair with some pitting. This individual is only represented by three mandibular molars: the two first molars as well as the right second molar. Lunt records that there were fragments of the cranial vault and maxilla with 29 permanent teeth, including the un-erupted third molars (1985: 153). As well, the plan (1985: Fig. 40) clearly shows a partial individual in a flexed position. The bones are missing from the stores. Both first molars have small carious lesions on their occlusal surface which Lunt also notes (1985: 153). The left first mandibular molar also has small supragingival flecks of calculus on the occlusal surface, which perhaps indicates a tooth loss in the maxilla and disuse of the mandibular molar. No further comments can be made on the limited remains of this individual.

Grave 49

The child within Grave 49 (LL1176) is five years +/- sixteen months at death. Surface preservation of the skeletal material is very poor with most of the bones consolidated with dirt adhered to the surface. Approximately 10.0% of the skeleton is present, including about 65.0% of the cranium. The only postcranial bones recovered include: two humeri, two femora, some ribs and a few indeterminate long bones. There were 14 deciduous and nine developing permanent teeth examined, all of which are loose. Due to the exceptionally poor state of preservation, none of the skeletal material could be assessed for pathologies. The estimated age of the child agrees with Lunt (1985: 153).

Grave 50

The adult within Grave 50 (LL1211) is a female aged 18-24 years at death. Surface preservation of the skeletal material is good to moderate with many of the bones showing only minor taphonomic damage, with the exception of several bones which have been consolidated with dirt. Approximately 80.0% of the skeleton is present, including about 75.0% of the cranium. Most body parts are represented bilaterally to some extent. The level of fragmentation varies across the material from intact elements to very fragmentary, which impacts on the ability to assess for pathologies. The only elements which are partially or wholly missing post-mortem are the thoracic vertebrae, the bones of the pelvic girdle, the hand and wrist bones, foot phalanges and the ribs. There were 12 maxillary and 12 mandibular teeth examined, of which only the maxillary left premolar is in position. This individual suffered from fairly severe dental disease.

All teeth display very mild wear. Fifteen of the teeth display supragingival calculus, ranging from mild patches to severe planks which extend along the crown. The mandibular right third molar and left second molar seem to have small patches of calculus on the occlusal aspect of the crown, which would possibly indicate that the tooth was not used for enough time for plaque to form and mineralize on the tooth. The maxillary right third molar is not present, but the maxillary left second molar was examined and shows minimal wear. Both mandibular canines exhibit a mild LEH in the cervical third of the tooth, reflecting a stress early in life when the tooth was still forming, though neither of the maxillary canines display LEH. The right mandibular first molar has a large carious lesion which would have started on the occlusal aspect but has destroyed most of the dentine of the crown and opened the root canals. According to Lunt, this would have almost certainly resulted in infection of the pulp which would be expressed in a chronic abscess or dental cyst at the root apices (1985: 153). This tooth also displays severe supragingival planks of calculus covering most of the remaining crown. The maxillary right lateral incisor is malformed in the form of a small peg-shaped tooth. Lunt records that it seems that there is no socket for the left lateral incisor which may have been congenitally absent, which is not an uncommon trait (1985: 153).

In regards to pathologies expressed on the bones, both the frontal and the sphenoid display cribra orbitalia or mild porosity in the orbital sockets. The only evidence of porosity on the rest of the cranial vault occurs on the right side of the frontal where the temporal line is particularly rugged with areas of porous bone just superior to it. None of the postcranial material displays porosity or cortical thinning. Possible causes of porosity in the orbits and general cranium include infectious diseases, metabolic disorders or hematopoietic diseases. There is no evidence of trauma and the rest of the calvarium is unaffected with porosity. The spinous process of the second cervical vertebra is remodelled with some bone growth extending the point. There is no evidence of trauma. The left tibia has a patch of new woven bone in the proximal third of the diaphysis on the medial aspect. There is no evidence of a fracture and osteoarthritic changes could not be assessed as both epiphyses are missing. The right tibia does not display any pathological changes, nor does the left femur or the left fibula. New woven bone on the diaphysis most likely represents an incidence of minor blunt trauma to the diaphysis which caused new bone to form. One of the six proximal foot phalanges recovered exhibits remodelling of the distal epiphysis, with proximally directed bone growth. There is no evidence of trauma. None of the other foot phalanges or metatarsals displays any pathology. Overall, this individual does not display a general osteoarthritic condition.

Grave 53

The adult within Grave 53 (LL1217) is a probable male aged 42-56 years at death. Surface preservation of the skeletal material is quite poor as most of the bones were treated with consolidant which has obscured the bone surface in some cases. This is particularly a problem with the cranium which is conserved using fabric on the external surface. Approximately 45.0% of the skeleton is present, including about 25.0% of the cranium. The arm long bones, except for a radius are present, as are one clavicle, one scapula, a right femur, both tibiae, a few hand bones and only very few foot/ankle bones. There are no carpals, no lumbar vertebrae and only minimal cervical and thoracic vertebrae, rib fragments and pelvic girdle. There were 12 maxillary, 11 mandibular permanent teeth and one unidentified tooth examined, all the maxillary teeth are in position and all the mandibular teeth are loose. The teeth show very heavy attrition, which has likely affected the age estimation. As well, there is some evidence for dental disease, in the form of ante-mortem tooth loss of the maxillary left first molar. The alveolar bone has completely resorbed and there is minimal pitting along the bone. The maxilla and maxillary teeth are in a very poor state of preservation with many teeth crumbling and glued into place. Lunt observed a 'molar root in the right maxilla that is lying in a fairly large abscess cavity' (1985: 153). This was not recorded in this study, likely due to conservation and preservation issues. There is no further evidence of dental disease. The majority of the postcranial material cannot be assessed for pathologies. The only pathology observed is on the second cervical vertebra with osteophytes projecting superiorly from the superior aspect of the dens at the point of attachment of the apical ligament. There is no other evidence of pathologies on the bones.

<u>Grave 56</u>

The adult within Grave 56 (LL1294) is a female aged 20-26 year at death. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration. Approximately 75.0% of the skeleton is present, including about 45.0% of the cranium. All of the skeletal remains are quite small and gracile. Most body parts are represented bilaterally to some degree. All of the long bones are represented and there are a few foot and ankle bones present. The vertebral groups are all represented but only minimally, as are the ribs. The left os coxa, sacrum and all hand bones are missing. Only the three right mandibular molars are present and in position. The first molar exhibits a large carious lesion on the mesial half of the occlusal surface which has destroyed most of the mesial half of the crown to the cemeto-enamel junction. There is no further evidence of dental disease. The only pathology observed on the postcranial material occurs on a proximal foot phalanx. This osteoarthritic change appears as extension and remodelling of the plantar aspect of the distal epiphysis towards the proximal end. None of the other four proximal foot phalanges display any pathological changes. There is no evidence of trauma. There were no other pathologies observed. This grave is not recorded by Lunt.

Appendix G: Description of the skeletal remains by discrete mortuary feature derived from Lemba-*Lakkous* with focus on the palaeopathology

**Note please that unless otherwise indicated, age estimation was based on molar wear (Miles 1963) or dental development (Ubelaker 1989) and sex assessment was almost solely based on cranial features (Buikstra and Ubelaker 1994). If the pelvic bones were present, sex was assessed based on them (Brooks and Suchey 1990; Phrenice 1969).

Overall, 47 discrete mortuary features with a minimum of 58 individuals were examined from the settlement site of Lemba-*Lakkous*. What follows is a grave by grave description of the human remains recovered and assessed with particular reference to any pathological lesion (for grave descriptions see Niklasson 1986:43-53, 134-149). This appendix provides a general synopsis of each grave examined, for details regarding each discrete skeleton observed at Lemba-*Lakkous*, refer to Appendix F.

Area I

Grave 2

Grave 2 (LL230) contains the remains at least one child. Surface preservation of the skeletal material is good to moderate with only mild taphonomic damage. However, the bones and teeth have all been consolidated with an unknown consolidant post excavation. Overall, 9.7% (n=3) of the skeletal material could not be assessed for pathologies. The child has an estimated age of five years +/-sixteen months at death. There is no evidence of dental disease and there were no pathologies observed on any of the bones.

Grave 3

Grave 3 (LL439) contains the remains of at least one child. Surface preservation of the skeletal material is moderate with some erosion and discolouration. Overall, 13.3% (n=13) of the skeletal material cannot be assessed for pathologies. The estimated age of the child is eight years +/- two years at death. There is no evidence of dental disease and there were no pathologies observed on any of the bones.

Grave 4

Grave 4 (LL267) contains the remains of at least one child. Surface preservation of the skeletal material is moderate to poor with erosion and discolouration affecting most of the skeletal material. Overall, 59.1% (n=13) of the skeletal material cannot be assessed for pathologies. The child is aged three years +/- one year at death. One tooth displays evidence of a dental caries.

Grave 5

Grave 5 (LL266) contains the remains of at least one child. Surface preservation of the skeletal material is quite poor with erosion and discolouration affecting most of the recovered remains. Overall, 71.4% (n=10) of the skeletal material could not be assessed for pathologies. The estimated age of the child is four years +/- one year at death. No pathologies were observed on any of the skeletal material.

Grave 6

Grave 6 (LL303) contains the remains of at least four individuals, which also agrees with Lunt's assessment (1985:56). Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration. Overall, 20.9% (n=18) of the skeletal material cannot be assessed for pathologies. Skeleton A is an infant aged two years +/- eight months at death. Skeleton B is a child aged four years +/- one year at death. Skeleton C is a child aged eight years +/- two years at death and Skeleton D is a child aged eight years +/- two years at death.

It seems that while there is dentition reflecting four individuals, the postcranial material indicates that there is only one, possibly two subadults within the grave. There is no duplication of bone elements, and the majority of the material represents one skeleton which is approximately 75.0% complete. The size and stage of development of the bones seem to represent an individual five to nine years of age at death, which would correlate to either Skeleton C or D. This skeleton is missing both ulnae, the right lower leg long bones, the thoracic and lumbar vertebrae, the majority of the os coxae and most of the hand and wrist and foot and ankle bones. Three bone fragments, a cervical vertebra and two proximal hand phalanges likely represent a younger child, possibly Skeleton A. There is nothing in the grave description to indicate how the skeletal material was positioned within the grave. This study also agrees with Lunt that there is some uncertainty in the absolute number of individuals within this grave. It is relative certain that a minimum of three individuals are in this grave, whether Skeleton C and D represent the same individual is open for some debate (1985: 56). There is no evidence of dental disease and there were no pathologies observed on the bones.

Grave 11

Grave 11 (LL324) contains the remains of at least one adult and one subadult. Surface preservation of the skeletal material is quite poor with most of the material eroded and discoloured. Overall, 88.9% (n=16) of the skeletal material cannot be assessed for pathologies. The subadult is represented by a single right humerus which may be intrusive. There is no evidence of dental disease on the single tooth and there were no pathologies observed on the postcranial material.

Grave 19

Grave 19 (LL346) contains the remains of at least one infant. Surface preservation of the skeletal material is moderate with some erosion and discolouration. There were no pathologies observed on the three bones recovered.

Grave 22

Grave 22 (LL438) contains the remains of at least one adult. Surface preservation of the skeletal remains is predominately moderate with some erosion and discolouration. Overall, 42.6% (n=26) of the skeletal material cannot be assessed for pathologies. The individual is a possible female adult over the 21 years of age at death, based on cranial traits and dental development. This individual displays evidence of dental caries, attrition and possible ante-mortem tooth loss and mild osteoarthritic changes to the atlas and axis.

Grave 23

According to the publication, Grave 23 (LL444) is a single inhumation and the remains of the individual are in the glass cased display at the Paphos Museum (1985: 47, 56-57). However, boxes containing remains of what can only be a second individual were found and examined during the course of this study (based on a number of duplicated elements). There seems to be three possible explanations for this: either the boxes in the museum stores were mis-labelled and individual recorded here is not from Grave 23, or the individual on display is not actually from this grave, or there were two individuals within the grave and this was not reflected in the publication. Any of these options are possible and none of the missing graves for this study (listed below) is that of an adult according to the publication. The grave plan in the publication of Grave 23 does not seem to match the individual in the museum display. However, the material which is curated in the museum stores does seem to almost match the plan and the description which states that 'only upper part of leg bones [are] preserved' (1985:47). It is currently unknown where the individual within the display case is from. Therefore, since it seems that the individual currently on display at the museum is not from Grave 23 and because it is on display and difficult to access, it is not included within this study. Lunt's discussion of the teeth is in reference to this individual and therefore is not used in the current study (1985: 57). Based on the material examined from the museum stores, there is a minimum of one young adult female aged 18-26 years at death within Grave 23. Surface preservation of the skeletal material is moderate with some erosion and discolouration. Overall, 27.0% (n=24) of the skeletal material could not be assessed for pathologies. This individual displays caries and mild osteoarthritic changes to the atlas and the left first proximal foot phalanx.

Grave 24

Grave 24 (LL482) contains the remains of at least one subadult. Surface preservation of the skeletal material is quite poor with erosion and discolouration. The child is aged four years +/- one year. The teeth are in such poor preservation that 52.0% of them could not be assessed for pathologies. There is no evidence of dental disease and there were no pathologies observed on the bones.

Grave 25

Grave 25 (LL483) contains the remains of at least one adult. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration. Overall, 14.2% (n=16) of the skeletal material could not be assessed for pathologies. The individual is a probable female with a tentative age of 18-24 years at death. This individual was affected by severe dental disease, missing all mandibular molars, attrition, dental caries and calculus and the spine, left elbow and right wrist display degenerative changes, while the right tibia appears bowed due to possible cortical thinning.

Grave 30

Grave 30 (LL1033) contains the remains of at least one adult. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration. Overall, 11.6% (n=15) of the skeletal material cannot be assessed for pathologies. The individual is a male aged 30-42 years at death.

There are some discrepancies between the observations of the current study and those made by Lunt. First of all, she has determined that there were two individuals within this grave, a conclusion which this observer disagrees with. Her rational was based on the mandible fragments recovered of which one is more robust and the other 'mandibular angle is of a much lighter build' (1985:57). After examining the two mandible fragments, it would seem that though the right gonial angle (Skeleton B according to Lunt) is slightly thinner than the rest it is not significantly so and could very well be attributed to the same individual. This seemingly is confirmed by the complete lack of duplicated bone elements or dentition within the grave. The canine which was labelled as 'intrusive' by Lunt seems to be a perfect match to the left maxillary canine. Another area of disparity is in the preservation of the dentition, as Lunt had a portion of the anterior section of mandible with teeth in position (1985:57). While the anterior portion of the mandible was recovered, there were no teeth in position but sockets where the teeth were lost post mortem. This possibly reflects problems with curation and storage. This individual displays evidence of carious lesions, attrition, calculus and LEH and osteoarthritic changes affecting both shoulders, the spine and a distal hand phalanx. As well, it appears that this individual may have suffered from chronic sinus infection.

Grave 31

Grave 31 (LL1034) contains the remains of at least one infant. Surface preservation of the skeletal material is predominately moderate however the teeth are in very poor condition. The estimated age of the infant is birth +/- 2 months. There were no pathologies observed on the bones.

Grave 35

Grave 35 (LL1038) contains the remains of at least one adult. Surface preservation of the skeletal remains is moderate with some erosion and discolouration. Overall, 16.8% (n=19) of the skeletal material cannot be assessed for pathologies. This individual is a female aged 20-52 years at death, who was affected by dental disease with antemortem tooth loss, moderate supragingival calclulus and heavy attrition. The atlas and a single carpal display minor osteoarthritic changes.

Grave 36

Grave 36 (LL1039) contains the remains of at least one infant. Surface preservation of the skeletal material is moderate to poor with all the bones and teeth eroded and discoloured. Overall, 20.5% (n=8) of the skeletal material cannot be assessed for pathologies. The estimated age of the infant is nine months +/- three months at death. There is no evidence of dental disease and there were no pathologies observed.

Grave 39

Grave 39 (LL1042) contains the remains of at least one infant. Surface preservation of the bones is quite good with minimal taphonomic damage. However, surface preservation of the teeth is quite poor, severely eroded, 60.0% of which cannot be assessed for pathologies. The estimated age of the infant is nine months +/- three months at death. There is no evidence of dental disease and there were not pathologies observed on the bones.

Grave 43

Grave 43 (LL1045) contains the remains of at least one adolescent. Surface preservation of the skeletal material is predominately moderate barring several elements which are consolidated and obscured. Overall, 38.4% (n=48) of the skeletal material cannot be assessed for pathologies. The individual is aged fifteen years +/- three years at death. There is no evidence of dental disease and there were no pathologies observed.

Grave 45

Grave 45 (LL1047) contains the remains of at least one subadult. Surface preservation of the skeletal material is good to moderate with only some of the material displaying some erosion and discolouration. Overall, 6.6% (n=5) of the skeletal material cannot be assessed for pathologies. The estimated age of the infant is two years +/- eight months at death. There is no evidence of dental pathology and small patches of porosity on the right parietal represent the only pathology observed on the bones.

Grave 54

Grave 54 (LL1330) contains the remains of at least one infant. Surface preservation of the skeletal material is moderate with some erosion and discolouration. Overall, 15.6% (n=8) of the skeletal material cannot be assessed for pathologies. The estimated age of the infant is three to nine months at death. There is no evidence of dental disease and there were no pathologies observed on the bones.

Area II

Grave 7

Grave 7 (LL77) contains the remains of at least one subadult. Surface preservation of the skeletal material is moderate to poor with many elements displaying some erosion and discolouration, and several bones consolidated and obscured. The estimated age of the individual is ten to twelve years at death. There is no evidence of pathologies on the teeth or bones.

Grave 8 (=17 A and B)

See Grave 17 for a full description.

Grave 9

Grave 9 (LL308) contains the remains of at least two highly fragmentary skeletons of an adult and an infant. Surface preservation of the skeletal material is moderate to poor with erosion and discolouration of all the bones. Overall, 43.5% of the skeletal material could not be assessed for pathologies. There were no pathologies observed on the bones.

Grave 10

Grave 10 (LL317) contains the remains of a minimum of two commingled individuals which were found scattered around the pit (1985: 138). Surface preservation of the skeletal material is moderate to poor with some erosion and discolouration affecting all the bones and several which are consolidated and obscured. Overall, 63.2% (n=24) of the skeletal material cannot be assessed for pathologies. Skeleton A is an infant aged two years +/- eight months at death and Skeleton B is a child aged three years +/- one year at death. While there is very little preserved skeletal material, there are several bones which cannot be attributed to a particular individual, including: indeterminate cranial fragments, two indeterminate metacarpals, and very fragmentary vertebrae. Most of this material could not be assessed for pathologies due to poor preservation.

Grave 12

Grave 12 (LL327) contains the remains of at least one subadult. Surface preservation of the skeletal material is good to moderate with many bones displaying only mild taphonomic damage. Overall, 23.1% (n=21) of the skeletal material cannot be assessed for pathologies. The estimated age of the individual is seven years +/- two years at death. The skeleton is quite complete, particularly if the intrusive right humerus from Grave 11 is associated with this skeleton, which may be the case based on size and given the possible movement of remains within the site (see below). There were no pathologies observed on the bones.

Grave 13

Grave 13 (LL328) contains the remains of at least one subadult. Surface preservation of the bones is predominately moderate with some erosion and discolouration. However, the teeth are in very poor condition. Overall, 66.7% (n=10) of the skeletal material cannot be assessed for pathologies. The estimated age of the child is five years +/- sixteen months at death. Porosity of the frontal orbits is the only pathology observed.

Grave 14

Grave 14 (LL329) contains the remains of at least one infant. Surface preservation of the skeletal material is moderate however highly fragmentary. A quarter (n=1) of the skeletal material could not be assessed for pathologies. No pathologies were observed on any of the bones.

Grave 15

Grave 15 (LL330) contains a few fragmentary remains of at least one infant. Surface preservation of the skeletal material is moderate. The estimated age of this individual is six months +/- three months at death. Lunt determined that the petrous portions of the temporal bones from Grave 14 and 15 could belong to the same individual based on their size and has assessed them as being from opposite sides (1985: 151). However, when examined for this study, they are both from the left side, which would mean that Grave 14 and 15 each contain a different individual. There were no pathologies observed.

Grave 16

Grave 16 (LL331) contains the remains of a minimum of two subadults. This is a tentative assessment based on different stages of development of the teeth present. Surface preservation of the bones is good to moderate with some erosion and discolouration on some of the bones. However, surface preservation of the teeth is very poor. Overall, 25.6% (n=11) of the skeletal material could not be assessed for pathologies. The estimated age of one individual is four to six years and the other is eight to nine years at death. Lunt estimates that there is a single individual aged eight to nine years, but has to qualify that the presence of the deciduous lateral incisor would reflect a retained tooth (1985: 151). Age estimation is hampered by post-mortem damage to many of the tooth roots. The bones seem to belong to the four to six year old individual, based on development and size. There is no evidence of disease on the bones. A single maxillary permanent first molar displays two small carious lesions on the occlusal surface.

Grave 17

Grave 17 is also recorded as Grave 8 Skeleton A and Skeleton B (LL338 and LL299). Based on the publication there were three burials excavated, with Skeleton A and Skeleton B in an upper pit and Skeleton C (LL332), consisting of only a skull and some disarticulated postcranial material in the lower pit (1985: 136). The upper pit was initially labelled as Grave 8 so Grave 8 will be now called Grave 17 with

Skeletons A and B within. However there is still some confusion as to which skeletal material belongs to which individual. The MNI for Grave 17 is three, with one adult and two infants. Surface preservation of the skeletal material is moderate to poor, with erosion and discolouration affecting all the bones and the teeth are predominately in poor preservation. Skeleton A is an adult represented by very few bones. Skeleton B is an infant aged six months +/- three months and Skeleton C is an infant aged two years +/- eight months. Skeleton C displays cribra orbitalia, which is the only pathology recorded within this grave context, affecting one of two subadult frontal bones present.

Grave 18

Grave 18 (LL1030) contains the remains of at least one individual. Surface preservation of the skeletal material is moderate to poor with all bones displaying some erosion and discolouration. Overall, 57.4% (n= 27) of the skeletal material cannot be assessed for pathologies due to poor preservation and high fragmentation levels. The estimated age for this individual is 14-18 years at death. There were no pathologies observed on either the bones or the teeth.

Grave 21

Grave 21 (LL1031) contains a maxillary left first molar which is the only human skeletal element recovered. Surface preservation of the tooth is moderate with some taphonomic pitting. This tooth likely represents an individual aged four to eight years at death. The tooth has a very large root cavity, but is otherwise normal. There is no evidence of dental disease. These observations agree with Lunt's assessment (1985:151).

Grave 26

Grave 26 (LL550) contains the remains of at least one adult. Surface preservation of the skeletal material is moderate with some erosion and discolouration. Overall, 28.0% (n=26) of the skeletal material could not be assessed for pathologies. The individual represents an adult male aged 36-48 years at death. The individual suffered from extensive dental disease with caries, ante-mortem tooth loss, calculus and attrition and osteoarthritic changes to the spine, ribs, elbows and shoulders.

Grave 29

Grave 29 (LL1032) contains the remains of at least one adult. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration, however many of the teeth are in very poor condition. Overall, 36.8% (n=28) of the skeletal material cannot be assessed for pathologies. The individual is a young adult female aged 20-24 years at death based on dental wear. LEH, a dental caries and calculus were observed on one tooth each, however surface preservation of the teeth is very poor. There were no pathologies observed on the bones.

Grave 32

Grave 32 (LL1035) contains the remains of at least one individual. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration. Overall, 10.8% (n=10) of the skeletal material cannot be assessed for pathologies. The individual is an adolescent aged twelve +/- 30 months at death. There were no pathologies observed on the teeth. There is mild porosity observed in the orbits of the frontal bone. No further pathologies were observed.

Grave 33

Grave 33 (LL1036) contains the remains of at least two individuals. Surface preservation of the skeletal material is predominately good to moderate with minimal taphonomic damage. Overall, 23.3% (n=35) of the skeletal material could not be assessed for pathologies. There are several bones labelled as, 'bones included with Burial 33' which represent the second individual within the grave. It is unclear based on this description if they actually represent a second individual within the grave or if they were nearby. They consist of a set of right and left metatarsals, all of which are concreted and were not able to be assessed for pathologies. One individual is an adolescent of indeterminate sex aged 12-18 years at death. LEH, calculus and caries are observed on the dentition. Both the atlas and axis display osteophytes at their articulation. There are no other pathologies recorded on the bones.

Grave 34

Grave 34 (LL1034) contains the remains of at least one infant. Surface preservation of the bones is moderate, however the preservation of the teeth is very poor. Just over half (51.3%, n=20) of the skeletal material could not be assessed for pathologies. The estimated age of the infant is one year +/- four months. There is no evidence of dental pathology and only a small patch of woven bone and porosity on a single parietal fragment.

Grave 37

Grave 37 (LL1040) contains the remains of at least one adult. Surface preservation of the bones is moderate, however the preservation of the teeth is very poor. None of the teeth can be assessed for all pathologies. The individual is an adult possibly female aged 20-35 years at death. Despite the poor preservation, one tooth displays carious lesions.

Grave 38

Grave 38 (LL1041) contains the remains of at least one infant. The surface preservation of the bones is moderate. However, the teeth are in very poor condition. None of the teeth can be assessed for pathologies. The estimated age of the infant is six months +/- three months at death. There were no pathologies observed.

Grave 40

Grave 40 (LL1043) contains the remains of at least one adult. Surface preservation of the bones is predominately moderate. However, the teeth are in fairly poor condition. Overall, 40.5% (n=17) of the skeletal material cannot be assessed for pathologies. The individual is tentatively aged 30-38 years at death. There were no pathologies observed.

Grave 41

Grave 41 (LL1044) contains the remains of at least one subadult. Surface preservation of the bones is mostly moderate though highly fragmentary. The dentition is in very poor preservation. Only one tooth could be assessed for pathologies. The estimated age of the child is six to ten years at death. There were no pathologies observed.

Grave 44

Grave 44 (LL1046) contains the remains of at least one subadult. Surface preservation of the bones is moderate. However, preservation of the teeth is moderate to poor. Overall, 37.9% (n=25) of the skeletal material could not be assessed for pathologies.

The estimated age of the child is four to eight years at death. There is no evidence of dental pathology and there were no pathologies observed on the bones.

Grave 46

Grave 46 (LL1156) contains the remains of at least one subadult. Surface preservation of the bones is moderate with some erosion and discolouration. Preservation of the teeth is moderate to poor with 29.2% (n=14) of the skeletal material which cannot be assessed for pathologies. The estimated age of the child is five years +/- sixteen months at death. One tooth displays severe caries resulting in an abscess in the alveolar bone. There were no pathologies conclusively observed on the bones.

Grave 47

Grave 47 (LL1146) contains the remains of at least two individuals. Surface preservation of the skeletal material is predominately moderate, with the exception of the cranium which is concreted with dirt and cannot be assessed. Overall, 17.4% (n=8) of the skeletal material cannot be assessed for pathologies. The majority of the skeletal material belongs to a child aged two to four years at death. The only evidence of a second individual is a pair of young infant size femora. There is no evidence of dental pathology and there were no pathologies observed on the bones.

Grave 48

Grave 48 (LL1147) contains the remains of at least one individual. Surface preservation of the teeth is fair with some pitting. The adolescent individual has an estimated age of 14-20 years at death. Two of the three teeth recovered display carious lesions and the third has calculus. There were no bones examined for this context.

Grave 49

Grave 49 (LL1176) contains the remains of at least one subadult. Surface preservation of the skeletal material is very poor with most of the bones consolidated with dirt adhered to the surface. The poor preservation is reflected in the calculation that 97.4% (n=38) of the skeletal material could not be assessed for pathologies (all but one element). The estimated age of the child is five years +/- sixteen months at death. No pathologies could be assessed for.

Grave 50

Grave 50 (LL1211) contains the remains of at least one adult. Surface preservation of the skeletal material is good to moderate with many of the bones showing only minor taphonomic damage. However, there is the exception of several bones which have been consolidated with dirt. Overall, 13.4% (n=18) of the skeletal material could not be assessed for pathologies. The individual is an adult female aged 18-24 years at death. Most of the teeth display calculus and there is a carious lesion on one tooth and LEH on two teeth. The frontal orbits and sphenoid display mild porosity with a non-specific aetiology. Osteoarthritic changes affect the axis and a proximal foot phalanx. The left tibia displays possible evidence of trauma.

Grave 53

Grave 53 (LL1217) contains the remains of at least one adult. Surface preservation of the skeletal material is quite poor as most of the bones were treated with consolidant which has obscured the bone surface in some cases. Just over half (51.5%, n=34) of the skeletal material cannot be assessed for pathologies. The individual is an adult possibly male aged 42-56 years at death. Ante-mortem tooth loss is the only evidence of dental pathology. Only the axis displays osteoarthritic changes.

Grave 56

Grave 56 (LL1294) contains the remains of at least one adult. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration. Overall, 15.2% (n=10) of the skeletal material cannot be assessed for pathologies. The individual is an adult female aged 20-26 year at death. Mild osteoarthritic changes affect one foot phalanx and one tooth displays a carious lesion.

Missing Graves

The human remains from Graves 1, 55 and 57 could not be located within the museum stores. As well, only a single tooth from Grave 48 was found with the bone material of an adolescent missing. Most of the teeth are missing from Grave 9. According to the previous publication of the Lemba material, Grave 1 should contain a single skeleton of child aged one to two years represented by at least nine loose teeth (1985: 45). Grave 55 should contain a single skeleton of an infant or child

(1985: 135). And Grave 57, a disturbed context, should contain the pelvis, ribs and some small bones of an infant or very young child (1985: 141). Graves 27, 28, 20, 42 and 51, according to the publication, did not include any human remains (1985: 47, 139, 140, 141). Grave 52 was not excavated according to the publication (1985: 141).

Determining a MNI for Lemba-Lakkous

Lunt observes that the mandibular right first permanent molar of Grave 10 Skeleton A exactly matches the left first mandibular molar from Grave 6A in morphology and suggests that this may indicate a scattering of human skeletal material around the site or that these two individuals may be closely related (1985: 150). This scattering of skeletal material, by taphonomy or human intervention seems likely. Levels of decomposition at the time of re-location and selective movement of particular parts of the body (i.e. the cranium) would have a great affect on the archaeological assessment of the human remains. If there is extensive movement of skeletal elements, determining an accurate MNI for the site becomes difficult when analysed on a grave-by-grave basis. Given the poor state of preservation on the site there is a high probability of finding only partial skeletons due to taphonomic processes. If there is the added complication that a single individual may be scattered over a number of burial contexts, discussing the demographics of a mortuary population becomes almost impossible. It seems, based on the analysis of the postcranial material for graves 10, 11 and 12 that there was some mixing of material. There is an intrusive right humerus in Grave 11 which likely belongs with the individual from Grave 12 as they are of comparable size and morphology. Thus, it would seem, particularly in this area, that there was mixing of human bone across different burial contexts.

Appendix H: Description of the discrete skeletons from Kissonerga-*Mosphilia* settlement with particular reference to the pathology

**Note please that unless otherwise indicated, age estimation was based on molar wear (Miles 1963) or dental development (Ubelaker 1989) and sex assessment was almost solely based on cranial features (Buikstra and Ubelaker 1994). If the pelvic bones were present, then they were used to assess sex (Brooks and Suchey 1990; Phrenice 1969).

Overall, 62 discrete mortuary features with a minimum of 80 individuals (MNI) were studied for the settlement site of Kissonerga-*Mosphilia*. What follows is a grave by grave description of the discrete skeletons recovered and assessed with particular reference to any pathological lesion observed. The differences observed between the current analysis and the previous study by D.A. Lunt and M.E. Watt (1998) highlight a few of important points. First, that perhaps it is beneficial for observers with different academic backgrounds to examine the material for different perspectives. Second, that access to radiographs can enhance the observers' ability to discuss age and pathologies of human osteological material and that much more information can be drawn by looking at the entire individual rather than just a portion. And thirdly, is the importance of immediate access to material from excavation. Sadly, there are a number of missing elements from this current study, for which there is no reasonable explanation for their disappearance. It must be noted, that Lunt and Watt (1998) did not record for calculus accumulation, so where that is noted, invariably it will not have been recorded by them.

<u>Grave 501</u>

The child within Grave 501 (KM369) is tentatively aged two to four years at death. Surface preservation of the skeletal material is fair, with some taphonomic damage. Approximately 30.0% of the skeleton is present. There cranium is completely absent, as are all the carpals and all but one tarsal. The only bones present include: the right humerus, right and left radii, the right and left femora, two fibulae, very few hand and foot bones and highly fragmentary vertebra from all groups and os coxa. The only tooth examined is a deciduous left maxillary first incisor. No pathologies were noted on the material. There is no record in the original report of the dentition from this grave and no age assessment is given other than ‘child’ (Lunt and Watt 1998: 87).

<u>Grave 502</u>

The child within Grave 502 (KM560) has an estimated age of one year +/- four months at death. Surface preservation is predominately moderate. Approximately 20.0% of the cranium is present. There is no postcranial material recovered. The left deciduous maxillary second and first molars and canine were examined, with very poor preservation. No pathologies were observed on any of the material. However, due to the level of poor preservation, the dentition could not be assessed. The original report records the burial as containing one male child (1998: 87) and the age assessment disagrees with the determination within this study (older than two years). Lunt and Watt discuss the possibility of carious lesions on two of the teeth, however states that preservation is too poor to be conclusive (1998: 109).

<u>Grave 504</u>

The child within Grave 504 (KM559) is aged five years +/- 16 months at death. Surface preservation of the skeletal material is quite poor, as most of the surfaces are obscured with consolidant. Approximately 35.0% of the skeleton is present, including about 55.0% of the cranium. Most of the long bones are present, with the exception of one ulna and one radius and several cervical vertebrae. There are no hand and wrist bones, foot and ankle bones, thoracic or lumbar vertebrae nor is there any of the pelvic girdle present. Three deciduous and four permanent maxillary and six deciduous and eight permanent mandibular teeth were examined, of which all but two of the mandibular teeth are in position, while all the maxillary teeth are loose. There were no pathologies observed, however the majority of the material could not be assessed due to preservation issues. Lunt and Watt’s age assessment agrees with the one within this study and they do not note any dental pathology (1998: 109).

<u>Grave 505</u>

Skeleton A (or West skeleton KM553.10) is an adolescent aged 16-22 years at death. Surface preservation of the skeletal material is fair to moderate. Approximately 85.0% of the skeleton is present. No cranial bone was recovered with the exception of fragments of the maxilla. All the long bones are present however most of the bones are missing their epiphyses. Almost all the hand and wrist and foot and ankle bones are missing and the pelvic girdle is quite fragmentary. There were five maxillary and 13 mandibular teeth and one indeterminate tooth examined, of which three left maxillary and six left mandibular teeth are in position. There is no evidence of dental pathology. However, one of the molars has very unusual morphology. Osteoarthritic changes are observed on several articular facets and one body of a thoracic and a lumbar vertebra with osteophytic growth. The distal epiphysis of the left first metatarsal is remodelled, extending the articular facet proximally and laterally. There is no evidence of trauma. The right first metatarsal was not recovered and the other left metatarsals do not display any pathological changes, representing a localised change. Lunt and Watt suggest and age of 18 years +/- one year (1998: 109).

Skeleton B (or East skeleton KM553.11) is an adult probable female. Surface preservation is moderate to poor. Approximately 25.0% of the skeleton is present, including about 40.0% of the highly fragmentary cranium. Both scapulae, both ulnae, the right clavicle and right humerus are present. Other than a fragment of left femur, the lower limbs are absent, as are most of the hand and wrist bones and the vertebrae and pelvic girdle. A mandibular right canine and indeterminate tooth root were the only two teeth examined. There is no evidence of dental disease. The distal epiphysis of the right ulna has osteophytic growth on the anterior margin of the facet and the anterior margin of the inferior aspect of the body of the second cervical vertebra displays osteophytic growth. There is no evidence of trauma. The distal epiphysis of the left ulna is not present, nor are either radii and the minimal number of cervical vertebrae recovered are highly fragmentary. Lunt and Watt record that the maxilla with 14 maxillary teeth were observed and that there is a genetic abnormality, with the maxillary canine embedded in the palate which was observed in a radiograph (1998: 109). The maxilla and its dentition were not located for the current study. Lunt and Watt also record the individual’s age as 20-25 years, an assessment which was not possible for the current study due to the lack of dentition.

Skeleton C (KM553.13) is an adult aged 22-28 years at death. Surface preservation of the skeletal material is fairly poor and highly fragmentary. However, the teeth are in good condition. Approximately 5-10.0% of the skeleton is present, including a portion of the maxilla and one calvarial fragment. The only postcranial bone present includes:

both clavicles, a fragment of femur, several rib fragments and a small portion of os coxa. The rest of the skeleton is absent. There were ten maxillary and five left mandibular teeth and one indeterminate tooth root examined. Of which, all but one of the maxillary teeth were in position and only the left second mandibular molar is in position. There is mild to severe calculus on the right maxillary canine and first premolar and the left mandibular second and third molars. The maxillary left incisors both show heavy attrition and there is an unusual wear pattern between the maxillary right second incisor and the right canine creating a groove between the two teeth. As well, there is a possible apical abscess above the right second incisor in the maxillary bone. Lunt and Watt were able to radiograph the maxilla and determined that the abscess above the second incisor is most likely a nasopalatine cyst, a developmental defect of the maxilla (1998: 109). In regards to postcranial pathology, only the left first rib displays a pathological lesion, with slight extension of the vertebral articular facet. There were no vertebrae recovered with this individual.

*Skeleton D (*KM553.12) is recorded by Lunt and Watt (1998: 109) as a child aged 10 years +/- nine months. However, no dentition was found during the current assessment to support this. Amongst the unlabelled skeletal material, or that which is recorded from 'Chamber 1', there is postcranial material (approximately 15.0% of the skeleton with the left arm long bones and several other postcranial bones) which belongs to a younger individual. Surface preservation is quite poor and the bones are fragmentary and incomplete. There were no pathologies observed on these bones.

Grave 506

The adult within Grave 506 (KM571) is a female aged 18-26 years at death. Surface preservation of the skeletal material within this grave is moderate to poor, with the exception of the teeth which are in excellent condition. Approximately 90.0% of the skeleton is present including about 50.0% of the cranium, though consolidated with fabric adhered to the exterior surface. Most body parts are represented bilaterally to some degree. Of all the long bones, only one ulna is missing, as are most of the hand and wrist bones. Most tarsals and foot phalanges are missing but all metatarsals are present. While the os coxae are relatively well represented, the vertebrae and ribs are only minimally present and highly fragmentary. Sixteen maxillary and 16 mandibular teeth were examined, of which all but four teeth are in position. The only tooth with pathology is the right third mandibular molar which displays mild supragingival calculus patches on the mesial-buccal corner. There is no further evidence of dental disease. Two proximal foot phalanges of seven recovered display proximally directed bone growth and extension of one condyle on the plantar aspect of the distal epiphysis. There is no evidence of trauma. An intermediate and distal foot phalanx have fused, most likely reflecting a healed incidence of trauma or possible genetic variation if they are the fifth ray, as there are no other bones within this grave which display any ankylosis. Lunt and Watt's assessment of the dentition concurs with the one provided here, though they do not record any calculus (1998:110).

Grave 507

The child within Grave 507 (KM766) is aged five to nine years at death. The surface preservation of the skeletal material is moderate, though highly fragmentary. Approximately 60.0% of the skeleton is present including about 75.0% of the cranium. Most body parts are represented bilaterally to some degree, with the right humerus, left ulna and indeterminate fibula missing. All of the carpals and tarsals are absent, as are most of the hand and foot bones. The vertebrae and pelvic girdle are quite well represented. Eight deciduous and 13 developing permanent maxillary teeth, four deciduous and seven developing permanent mandibular teeth along with one indeterminate tooth root were examined. All of the teeth but five left mandibular and three left maxillary are loose. The crowns of the maxillary permanent canines have just been completed, both of which display a mild LEH in the cervical third of the crown. The mandibular permanent canines were not recovered for comparison and none of the other developing permanent teeth displayed the defect. There were no other pathologies observed on the skeleton. While the dental description and age assessment agrees with Lunt and Watt, they do not record LEH on the developing canines (1998: 110).

Grave 508

The individual within Grave 508 (KM662) is an adult male (based on the sciatic notch of the left ilium) aged 24-30 years at death. The surface preservation of the skeletal material within this grave is very poor. Most of the bones are treated with a consolidant which has adhered dirt to the surface. Approximately 20.0% of the skeleton is present, while the cranium is still *en bloc* and thus the cranial inventory is a preliminary one, about 75.0% complete. The humerus, ulna, clavicle, scapula, ilium, five hand phalanges and the fifth metacarpal are present and are all from the left side. The only bones from the right side are several fragmentary ribs. The lower limbs, most of the carpals, almost all the vertebrae and over half the pelvic girdle are completely absent. There were five maxillary teeth in position, one loose maxillary tooth and three loose mandibular teeth, all from the left side examined. There is no evidence of dental pathology and no pathologies were observed on the bones. This assessment agrees with Lunt and Watt (1998: 110).

Grave 509

Skeleton A (KM663) is an infant aged six months +/- three months at death. Surface preservation of the skeletal material within the grave is moderate to poor with eroded and discoloured surfaces. The teeth are in particularly poor condition. Approximately 10.0% of the skeleton is present, including about 20.0% of the cranium. The only postcranial bones are the long bones of the left arm. There were six maxillary and nine mandibular developing deciduous teeth examined, all of which are loose. There is no evidence of dental pathology and there were no pathologies observed the bones. Lunt and Watt provide a slightly younger age at death for this individual, but also do not observe any pathology (1998: 110).

Grave 510

The child within Grave 510 (KM624) is aged four to eight years at death, though likely at the younger end of this age estimation. Surface preservation of the skeletal material within the grave is quite fair overall, with the exception of the cranium which was consolidated rather poorly, obscuring the surface. Approximately 25.0% of the skeleton is present, including about 20.0% of the cranium plus the mandible. The left radius, femur and ilium are present, as well as two unsided fibulae and a scapula. A few hand phalanges, cervical vertebrae, ribs and metatarsals are also present, while the rest of the postcranial bones are absent. There were eight deciduous and 12 developing permanent maxillary teeth and ten deciduous and four developing permanent mandibular teeth examined. All of the mandibular deciduous teeth are in position with the first molars developing in their crypts and the maxillary teeth are all loose. There is no evidence of dental pathology and there were no pathologies observed on the bones. This assessment agrees with Lunt and Watt (1998: 110).

Grave 513

The infant within Grave 513 (KM767) is aged two years +/- eight months. Surface preservation of the skeletal material within the grave is moderate to poor with several consolidated bones with their surfaces obscured. Approximately 70.0% of the skeleton is present, including about 10.0% of the cranium plus the mandible. Most body parts are represented bilaterally to some degree. The left ulna, both scapulae, most thoracic vertebrae, all lumbar vertebrae, most of the hand and wrist bones and foot and ankle bones and all of the pelvic girdle are missing. There were six deciduous and three developing permanent maxillary teeth and nine deciduous and two developing permanent mandibular teeth examined, of which four maxillary and nine mandibular teeth are in position. There is no evidence of dental pathology and there were no pathologies observed on the bones. This assessment agrees with Lunt and Watt (1998: 110).

Grave 515

Skeleton A (KM769) is a probable male, aged very roughly 24-35 years at death based on Lovejoy (1985). Surface preservation is moderate to poor with many of the bones consolidated, obscuring the bone surfaces for assessment. Approximately 50.0% of the skeleton is present, including 60.0% of the cranium. While both scapulae and clavicles are represented, only one set of arm long bones is present along with some of the left hand and wrist bones. Both tibiae and femora are partially represented but there are no fibulae and no foot and ankle bones. Very few vertebrae and pelvic girdle bones are present. There were 16 maxillary and 14 mandibular teeth examined, of which five maxillary and five mandibular teeth are in position. Skeleton A displays mild to moderate supraginivial calculus on the maxillary right first, second and third molars as well as the mandibular right third molar. The maxillary second molar also displays a rather large carious lesion which has destroyed much of the distal half of the tooth, with the calculus occurring in small patches along the buccal aspect. The left maxillary molars and adjacent right teeth did not display any calculus, nor did the adjacent mandibular molars or left mandibular molars. There was no further evidence of periodontal disease. The left first rib and another right rib fragment display mild osteophytic growth around the vertebral articular facet, directed towards the posterior. There was no trauma observed. The other indeterminate rib fragments and several thoracic vertebrae fragments examined for Skeleton A did not display any pathological changes. There were no further pathologies observed on the bones. Lunt and Watt's analysis is similar, however several teeth were recovered with the postcranial material which they did not have access to (1998: 110).

Skeleton B (KM770 or East Skeleton) is an adult aged roughly to 26-32 years at death. Surface preservation of the skeletal material is moderate. Approximately 15.0% of the skeleton is present, including: 60.0% of the cranium, mandible fragments, several cervical vertebrae, a left radius and indeterminate humerus and ulna, along with several hand and wrist bones, ribs and an indeterminate tibia. There were ten maxillary and ten mandibular teeth examined, as well as two indeterminate tooth roots, all of which are loose. Mild to severe supragingival calculus was observed on eleven teeth, including: the left maxillary left second molar, second premolar and central incisor, the maxillary right second molar, the mandibular left canine and lateral incisor and the mandibular right central and lateral incisors, canine, first premolar and first molar. The anterior mandibular teeth in particular show severe supragingival calculus planks on the lingual surface of the tooth. The right maxillary second molar and right first and third mandibular molars have rather severe carious lesions which, in at least one case, have opened the pulp chamber. As well, both mandibular canines display mild LEH in the cervical third of the tooth crown. This indicated that Skeleton B suffered from a physiological stress as the canine tooth was developing. The maxillary right canine does not display a LEH. There were no pathologies observed on any of the bones recovered. The observations on the dentition agree with Lunt and Watt (1998: 110)

Grave 516

The child within Grave 516 (KM768) is aged four to eight years at death. Surface preservation of the skeletal material within this grave is moderate to poor. The bone material is predominately eroded and the cranium is consolidated with quite a bit of dirt adhered to the surface. Approximately 25.0% of the skeleton is preserved, including: 80.0% of the cranium and several limb long bones, consisting of both humeri, both femora and the left radius and tibia and a fibula. Both clavicles, the left scapula, several cervical vertebrae fragments, a portion of the right ilium and several ribs are also present. However, the bones of the hands and wrists and feet and ankles are absent. There were ten deciduous and ten developing permanent maxillary teeth and six deciduous and six developing permanent mandibular teeth examined, of which ten mandibular and six maxillary teeth in position. Either the first mandibular molars are early or the deciduous mandibular incisors are retarded in their resorption, which complicates the precision of the age estimation (as is noted above in the methodology). There is no evidence of dental pathology and there were no pathologies observed on the bone. These observations on the dentition agree with Lunt and Watt (1998: 111)

<u>Grave 517</u>

The infant within Grave 517 (KM 855) is aged two years +/- eight months at death. Surface preservation of the skeletal material is moderate to poor with most of the bones discoloured with some eroded areas. Approximately 10.0% of the skeleton is present, including: minimal cranial fragments, several cervical and thoracic vertebrae, an indeterminate humerus and femur. There were 13 teeth examined, five from the maxilla and seven from the mandible with one indeterminate root. Eleven of the teeth are deciduous, plus the permanent mandibular right central incisor. There is no evidence of dental pathology and there were no pathologies observed on the bones. These observations on the dentition agree with Lunt and Watt (1998: 111).

<u>Grave 518</u>

The infant within Grave 518 (KM981) is nine months +/- three months based on dental development and the still unfused metopic suture. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration to the bone surface. Approximately 5.0% of the skeleton is present, including: 25.0% of the cranium, several rib fragments, indeterminate vertebrae fragments and an indeterminate long bone. There were ten mandibular teeth examined, composed of eight developing deciduous teeth and the two first permanent molars. No maxillary teeth were observed. There is no evidence of dental pathology and none of the postcranial bones could be assessed for pathologies due to the highly fragmented state of the bones. These observations on the dentition agree with Lunt and Watt (1998:111).

Grave 519

The child within Grave 519 (KM1065) is five years +/- sixteen months. Surface preservation of the skeletal material is predominately moderate. However, tooth preservation is extremely poor and tooth identification is quite difficult. Lunt and Watt's assessment highlights this point, as they estimate that there are two individuals present within this grave (1998: 111). Approximately 60.0% of cranium is present. There are no postcranial bones. The maxillary left first premolar and first molar and left second mandibular molar, along with two indeterminate teeth were examined. None of the teeth could be assessed for pathologies and none of the cranial bones displayed any pathology.

Grave 520

The adult within Grave 520 (KM1066) is a female aged 34-38 years at death. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration of the bone surface. Age estimation is complicated by particularly heavy and unusual wear. Approximately 15.0% of the skeleton is present, consisting of: approximately 35.0% of the cranium, the left humerus, right radius, indeterminate radius, a clavicle, mandible fragments and cervical vertebrae fragments. There were eight teeth examined, four maxillary, three mandibular and one indeterminate. Five teeth show very heavy attrition, while others display quite minimal wear. The maxillary left canine, first and second premolars and mandibular left first molar exhibit particularly heavy wear into the root and the indeterminate tooth is so worn it cannot be identified. While the maxillary left lateral incisor and mandibular left second and third molars display only minimal wear. This patterning would possibly suggest ante-mortem tooth loss. This cannot be verified as none of the maxillae or mandible survives intact, nor do any of the occluding teeth. There is no evidence of dental disease and there were no pathologies observed in the bones. This assessment of the dentition and the unusual wear agrees with Lunt and Watt's (1998: 111).

Grave 521

Skeleton A (KM1044.01) is a child aged eight years +/- two years at death. Surface preservation is quite good, particularly for the teeth. The cranium, which is approximately 40.0% complete, along with a portion of the mandible and 29 teeth were examined and attributed to Skeleton A. There are four deciduous, eight developing permanent teeth and one indeterminate maxillary tooth and four deciduous and 11 developing permanent mandibular teeth present. The deciduous teeth show evidence of wear. The only pathology observed is a very mild patch of supragingival calculus on the buccal aspect of the deciduous left maxillary second molar. This individual also has an anomalous peg or conical shaped tooth, which according to Lunt and Watt, is called a 'mesiodens' and is typically located in midline of the maxilla (1998: 111). This tooth is generally caused by a combination of genetic and environmental factors and is one of the most common types of supernumerary teeth. It is more common in males than females (Van Buggenhout and Bailleul-Forestier 2008). There were no pathologies observed on the cranial or mandibular bone.

Skeleton B (KM1044.02) is a child aged three to five years at death. Surface preservation is quite good. There were six mandibular teeth and one mandible fragment examined for Skeleton B. Several of these teeth were located within the postcranial material during assessment and are not included in Lunt and Watt's discussion (1998: 111). The teeth recovered are: the deciduous left mandibular second molar, the permanent mandibular left lateral incisor, left and right canines and left first and second molars. There is no evidence of pathology.

Grave 522

The child within Grave 522 (KM1045) is aged ten years +/- thirty months at death. Surface preservation is fair with minimal taphonomic damage. Approximately 20.0% of the skeleton is present, including approximately 75.0% of the cranium. The only postcranial elements present are: a right scapula, right and left clavicle, several thoracic and cervical vertebrae including the atlas, several hand bones most likely from the right side, several rib fragments and a small fragment of right os coxa. All long bones and the lower half of the body is missing entirely as are all the carpals, this may have to do with the fact that the grave was only partially excavated (1998: 91). Interestingly, in regards to preservation, while most of the postcranial material to survive is from the right, the dentition and mandible fragments are from the left. Nine permanent and two deciduous teeth were examined, six from the mandible and five from the maxilla, all but the mandibular first premolar are from the left. There is no evidence of dental disease and there were no pathologies observed on the bones. These observations on the dentition agree with Lunt and Watt (1998: 111).

Grave 524

The infant within Grave 524 (KM922) is aged two years +/- eight months. Surface preservation of the skeletal material is fair with some of the material with some erosion and discolouration of the surface. Approximately 75.0% of the skeleton is present, including the cranium which is approximately 85.0% complete. Most body parts are represented bilaterally to some degree. A radius, a fibula, the lumbar vertebrae, pelvic girdle, most of the small bones of the hands/wrists and feet/ankles are absent. There were ten deciduous and six developing permanent maxillary and ten deciduous and three developing permanent mandibular teeth examined. The deciduous right maxillary lateral incisor and canine both display mild supragingival calculus lines. None of the other deciduous dentition displays calculus. The right deciduous mandibular lateral incisor is in position and is possibly crowded as the labial aspect of the tooth is twisted to face the right deciduous central incisor. While the age estimation is the same, Lunt and Watt do not discuss calculus (1998: 112).

Grave 525

Skeleton A (KM923.01) is an infant aged two years +/- eight months at death. Surface preservation of the teeth is predominately good. There are only nine teeth and a mandible fragment within the grave which can be conclusively attributed to Skeleton A. There are five deciduous mandibular teeth along with both developing permanent first molars, which are both in position along with all but one of the deciduous teeth and there are two loose maxillary permanent teeth. There is no evidence of dental pathology. This age assessment agrees with Lunt and Watt (1998: 112).

Skeleton B (KM923.02) is a child aged four to eight years at death. Surface preservation of the teeth is predominately fair. There are four left permanent maxillary teeth and one left permanent mandibular tooth which are attributed to Skeleton B, along with an indeterminate tooth fragment. While it seems most likely that the cranial and postcranial bone within the grave belongs to this individual, it cannot be certain (see Grave 525 description). The left first maxillary molar has a slightly different level of preservation. However, it seems plausible that this tooth still belongs to Skeleton B. There is no evidence of dental pathology. There is some discrepancy in the age estimation between the current analysis and Lunt and Watt, who estimate a slightly younger age at death (1998:112).

Grave 526

Skeleton A (KM1175.1) is an adult female aged 18-24 years at death. The skeletal remains are very fragmentary with many of the bones consolidated and their surfaces obscured by dirt. This includes the cranium which is consolidated with glue and fabric over the exterior surface rendering any visual analysis impossible. Approximately 80.0% of the skeleton is present, including about 90.0% of the cranium. Most body parts are represented bilaterally to some degree. The only long bone missing is the right fibula and almost all the carpals and about half the tarsals are also absent post-mortem. The vertebrae and pelvic girdle are highly fragmentary. There were 15 maxillary and 15 mandibular permanent teeth examined, of which seven maxillary and 13 mandibular teeth are in position. A medium sized caries was observed on the mesial aspect of maxillary right canine. The mandibular left first, second and third molars, second premolar and lateral incisor along with the right central incisor display mild supragingival calculus. None of the other dentition displayed any evidence of calculus. Both mandibular canines exhibit a mild LEH in the cervical third of the tooth crown. None of the other teeth associated with Skeleton A display any evidence of dental disease. Lunt and Watt do not record the calculus observed (1998: 112).

Skeleton A also exhibits some postcranial pathology, predominately in the form of osteoarthritic changes. The second cervical vertebra has a small osteophyte projecting from the superior aspect of the dens at the site of attachment of the apical ligament. The left trapezoid has an altered morphology with no evidence of trauma or new bone growth, the proximal aspect is flattened. There are no other left carpals to compare to and the metacarpals associated with left hand do not display any changes. The right navicular and calcaneus both show changes to the general morphology with no evidence of trauma. The talar facet of the navicular is squared and there is a new facet formed below the tubercle which possibly indicates a poor articulation with the talus. The calcaneus displays a possible abnormal articulation with the formation of a new smooth facet on superior aspect, just anterior of the sustentaculum tali. None of the other right tarsals (the talus, cuboid, intermediate and lateral cuneiforms) display any evidence of morphological variation or poor articulation and the left navicular and calcaneus are not present. The right metatarsal displays mild osteophytic extension of the lateral facet on the dorsal aspect of the distal epiphysis. This is the only right metatarsal (of five) which displays any pathology and none of the left metatarsals display any pathology. There is no evidence of trauma and the right first proximal foot phalanx was not recovered.

Skeleton B (KM1175.2) is an adolescent individual aged 15 years +/- three years at death. The distal epiphyses of the metacarpals and metatarsals are not yet fused, which may indicate that Skeleton B is a male, as they tend to fuse by about 14 years of age in females and by 16 years in males (Baker *et al.* 2005: 130). The bones are very fragmentary which makes assessment difficult and surface preservation is moderate with some erosion and discolouration of the bones. Approximately 90.0% of the skeleton is present, including about 80.0% of the cranium which was very poorly conserved with consolidant. All body parts are represented bilaterally to some degree with all long bones present and only some hand and wrist and foot and ankle bones missing. The vertebrae are highly fragmentary. There were 15 maxillary and 15 mandibular teeth examined, of which six maxillary and 11 mandibular teeth are in position. The third molars are still in their crypts in fragments of the mandible. Tooth preservation is excellent, particularly those from the left side which are in position in the maxilla and mandible. Six mandibular teeth display a mild supragingival line of calculus on either the lingual or distal surfaces, including the maxillary right first molar, the mandibular left first premolar, lateral and central incisors and the mandibular right central and lateral incisors. None of the other dentition displays any evidence of dental pathology and there were no pathologies observed on any of the bones. This assessment agrees with Lunt and Watt’s (1998: 112).

<u>Grave 527</u>

The child within Grave 527 (KM1218) is aged two to four years at death. Surface preservation of the skeletal material is moderate with some erosion and discolouration of the bones. The bones are very fragmentary which makes assessment difficult. Approximately 20.0% of the skeleton is present including: 60.0% of the cranium, two humeri, an ulna, the right and left scapulae, several ribs and a few cervical vertebrae. The lower limbs and pelvis are completely absent. There were nine deciduous and four developing permanent maxillary and nine deciduous and five developing permanent mandibular teeth examined, of which only five teeth are loose with the rest in position. There was no evidence of dental pathology and there were no pathologies observed on the rather limited number of bones present. These observations on the dentition agree with Lunt and Watt (1998: 112).

Grave 528

The adult within Grave 528 (KM1219) is a female aged roughly 32-38 years at death. Surface preservation of the skeletal material is moderate with some erosion and discolouration of the surface. The individual is represented solely by a cranium approximately 65.0% complete and three maxillary molars. The left first maxillary molar displays much heavier wear than the right second and third right maxillary molars which may indicate ante-mortem tooth loss or an anomaly in occlusion. There is no evidence of dental disease and there were no pathologies observed on the cranial bone. Lunt and Watt provide an age at death of 25-35 years for this individual (1998: 112).

Grave 529

The child within Grave 529 (KM1292) is aged six to nine years at death. Surface preservation of skeletal material is very poor with the majority of it is consolidated with dirt adhered to the surface of the bone. Approximately 55.0% of the skeleton is present including approximately 60.0% of the cranium. The postcranial bones present are: all leg long bones, elements of both os coxae, both humeri and radii and some cervical vertebrae, while all other vertebrae are missing. There are only two hand bones present and no foot, ankle or wrist bones. There were five deciduous and six developing permanent maxillary and three deciduous and five developing permanent mandibular teeth examined, seven of which were loose while the others are in position. The left mandibular central and lateral incisors and canine are missing their crowns with only the roots in position. There is no evidence of dental pathology and there were no pathologies observed on the bone. These observations on the dentition agree with Lunt and Watt (1998: 112).

Grave 532

The adolescent within Grave 532 (KM1391) is aged 12-16 years at death. Surface preservation of the skeletal material is moderate to poor with some erosion and discolouration on the surface of most of the material and a small proportion which are missing portions of the cortical bone. Approximately 90.0% of the skeleton is present, including about 65.0% of the cranium. However, the bones are often incomplete. The skeleton was exceptionally well excavated with many of the unfused epiphyses recovered. All body parts are represented bilaterally in most cases, and there is good recovery of the small bones of the hands and wrists and feet and ankles with only about half missing. The surface preservation of the dentition is excellent, in a condition rarely seen on Cyprus. The full set of permanent dentition in position was observed. Twelve teeth display mild to moderate supragingival calculus, including: the maxillary left and right lateral incisors, maxillary right canine and first molar, the mandibular left first molar, first premolar and lateral and central incisors and the mandibular right lateral and central incisors, canine and first premolar. The maxillary central incisors and the mandibular canines all display a LEH in the cervical third of the crowns reflecting an incidence of stress while the tooth crowns were forming. There is no evidence of dental caries. The observations by Lunt and Watt are similar to those provided here, though they observed two incidences of LEH and provide a possible age of metabolic upset for the LEH at three and six years of age (1998: 112).

This individual also displays porosity, possible cribra orbitalia in the superior aspects of both the right and left orbits. The extent of the porosity is difficult to assess due to post-mortem damage which has destroyed a portion of the orbit. No porotic hyperostosis was observed on the identified left parietal nor on the indeterminate calvarial fragments. However, the diaphyses of both femora appear to bow laterally then return medially in a slight S-shape. As well, there are active lesions on the lateral aspect of both diaphyses. There was no evidence of trauma observed. Both femora are around 75.0% complete from the billowy proximal end (only the left unfused epiphysis is present) to the distal third of the diaphysis. Neither of the distal ends are preserved. Thinning of the cortex of the femur, which can lead to deformation of the diaphysis is sometimes a symptom of thalassemia (Ortner 2003: 365). Radiographs are required to ascertain the bone density of the medullary cavity and the possibility of growth arrest lines. Other metabolic disorders such as rickets or scurvy or vitamin B12 or folic acid deficiency could be responsible for the deformity of the femora, however thalassemia cannot be ruled out. There is no evidence of pathology on any of the other long bones, many of which are fairly complete. There were no other pathologies observed.

Grave 533

See grave description.

Grave 535

The adolescent within Grave 535 (KM2048) is aged 12 years +/- 30 months at death. The surface preservation of the skeletal material is good to fair with the majority of the material showing only mild taphonomic damage or slight erosion of the bone surface. Approximately 90.0% of the skeleton is present including approximately 70.0% of the cranium. All of the body parts are represented bilaterally to some degree with good recovery of the small bones of the hands and wrists and feet and ankles and the unfused epiphyses, as only some are missing post-mortem. There were 15 maxillary and 16 mandibular teeth examined, of which four maxillary and three mandibular teeth are loose and the rest are in position. Three of the developing third molars are present and according to Lunt the maxillary left third molar is congenitally absent (1998: 113). There is evidence of dental disease in the form of slight resorption of the maxillary alveoli which is best observed on the left side. As well, ten teeth, both mandibular and maxillary, display very mild to quite severe calculus. The four mandibular incisors exhibit severe supragingival ridges on the lingual and labial surfaces of the crown, while the four maxillary incisors display mild supragingival lines on the labial aspect of the crown and finally, the left first and second maxillary premolars both display mild to moderate supragingival ridges on the buccal aspect of the tooth. The mandibular right second premolar exhibits a mild LEH in the cervical third of the crown, most likely indicating a localized trauma as this defect is not reflected on any of the other teeth present. The only postcranial pathology occurs on the first cervical vertebra which displays some bony extension of the left inferior facet reflecting a mild osteoarthritic change. There is no evidence of trauma. There were no further pathologies observed on any of skeletal material. Lunt and Watt do not include observations of calculus (1998: 113).

Grave 537

See grave description.

Grave 538

The child within Grave 538 (KM1709) is aged five to nine years at death. Surface preservation of the skeletal material is predominately moderate. However, a number of the bones are treated with consolidant which has adhered dirt to the surface and prevents assessment. Approximately 60.0% of the skeleton is present, including approximately 40.0% of the cranium. Most of the body parts are represented to some degree bilaterally, with the right humerus and left ulna the only missing long bones. The clavicles are both absent and very few vertebrae and hand and wrist and foot and ankle bones were recovered. The pelvic girdle and ribs are highly fragmentary. Only three identifiable teeth were recovered: a maxillary left deciduous lateral incisor and canine and a developing permanent left maxillary second molar. An un-identified root was recovered as well. There is no evidence of dental pathology and there were no pathologies observed on any of the bones. Lunt and Watt's age estimation is somewhat younger (c. five years at death) than that given here based on root resorption (1998: 113).

Grave 539

South Skeleton (KM1754) is a probable male, based on Phrenice (1969) for the os coxa, aged 18-34 years at death, based on Brooks and Suchey (1990) for the os coxa and dental wear. Surface preservation of the skeletal material is moderate with some erosion and discolouration. However, the cranium is consolidated with fabric and dirt adhered to the exterior which does not allow for assessment. Approximately 80.0% of the skeleton is present, including 70.0% of the cranium. Most of the body parts are represented bilaterally to some degree. All the long bones are present, as are most of the hand bones. However, most of the carpals are missing and all the tarsals are missing. The spinal column is in very good preservation with most bodies intact and the bones of the pelvic girdle are fairly well represented. There were 13 maxillary and 13 mandibular permanent teeth examined along with an un-identified root fragment, some of the loose teeth have become mixed up and the right maxillary central incisor from North Skeleton has been attributed to the South Skeleton. Eight of the maxillary and five of the mandibular teeth are in position. The teeth are in quite good preservation. However, they have been treated with a consolidant which has adhered dirt to the surfaces in some places. Twenty of the teeth recovered display mild to severe supragingival calculus, mainly on the buccal aspect, but all surfaces are affected on some teeth. The maxillary left third molar to the left canine, both maxillary right central incisors, second premolar, first and third molars, the mandibular left third and first molars, first and second premolars, canine and central incisor and the mandibular right central and lateral incisors, canine and first molar are all affected. The right maxillary first molar also displays a very mild LEH in the middle third of the crown which must represent a localised trauma as there is no LEH observed on any of the other teeth. Very slight alveolar resorption was observed on the left side of the maxilla, which is most noticeable at the molars. Lunt and Watt's assessment of the dentition does not include discussion of the calculus (1998: 113).

The only postcranial pathologies observed on the South Skeleton reflect mild osteoarthritic changes to two bones. The acromion process of the left scapula shows extension and new woven bone growth and there is bone growth on the coracoid. There are no changes to the glenoid fossa. The acromion of the right scapula does not display any abnormal growth or alterations. There is no evidence of trauma or pathology to either; the rest of the left scapula, left clavicle or to the left humerus. Clinical studies show that there is a connection between the extension of the acromion with rotator cuff muscle tears (Konno *et al*. 2002). The distal epiphysis of the proximal foot phalanx is flattened and new bone growth extends proximally down the plantar aspect of the bone. None of the other foot phalanges display any osteoarthritic changes, so as there is no evidence of trauma, it is localized changes to the articular facet of the phalanx.

North Skeleton (KM1753) is an adult male aged 18-35 years, based on Todd (1920; Phase 5-6) and dental development (younger dental age of 18-22 years with Miles 1963). Surface preservation of the skeletal material is moderate overall with some material showing some erosion and discolouration. However, the cranium is consolidated with fabric which makes assessment difficult, particularly as the right side has been compressed into left side post-mortem. Approximately 75.0% of the skeleton is present including about 75.0% of the cranium. Most body parts are represented bilaterally to some degree, with the right arm long bones missing along with the left ulna. The spinal column is in good condition and the pelvic girdle and ribs are fairly well represented. Most of the hand and wrist and foot and ankle bones are missing post-mortem. There were 12 maxillary, seven mandibular permanent teeth and one unidentified tooth root examined, ten of which are in position. The only pathologies observed are calculus and LEH on the dentition. Thirteen teeth display calculus: both maxillary first and second molars, the left lateral incisor, the right central incisor, canine and first premolar and the mandibular left second molar and canine and the right second premolar, first and third molars. The maxillary right and mandibular left canines each display at least one LEH in the middle third of the tooth crown. It is not possible to assess the left maxillary canine as the surface is obscured by consolidant and dirt and the right mandibular canine is missing. Lunt and Watt do not comment on the calculus, but they were able to observe a cyst cavity within the middle of the mandible, however post-mortem damage means that the cause cannot be determined (1998: 113). There were no pathologies observed on the bones.

Grave 540

The infant within Grave 540 (KM1757) is aged six months to a year old at death. Surface preservation of the skeletal material is quite poor with eroded and discoloured surfaces. Approximately 5.0% of the skeleton is present, including: about 10.0% of the cranium and a few cervical vertebrae including the axis, two hand phalanges, several ribs, an indeterminate long bone and several very small, unidentifiable bone fragments. There were nine deciduous maxillary and seven deciduous mandibular teeth examined along with two developing first permanent molars and an unidentified tooth root. All of which were loose within the grave. There is no evidence of dental pathology and no pathologies were observed on the bones. The observations on the dentition agree with Lunt and Watt (1998: 113).

Grave 542

The child within Grave 542 (KM1858) is aged eight years+/- two years at death. Surface preservation of the skeletal material is predominately moderate. Approximately 50.0% of the skeleton is present, including approximately 50.0% of the cranium, mainly from the left side. The long bones of one arm are missing, along with a fibula, both scapulae, all carpals, all thoracic and lumbar vertebrae and most of the hand and foot and ankle bones. The cervical vertebrae, os coxae and ribs are present, though fragmented. There were six deciduous and 14 developing permanent maxillary and ten deciduous and four developing permanent mandibular teeth examined, of which all the deciduous mandibular teeth are in position as well as five of the maxillary teeth. There is no evidence of dental pathology and there were no pathologies observed on any of the bones. The observations on the dentition seem to agree with Lunt and Watt (1998: 113).

Grave 543

The infant within Grave 543 (KM1859) is very young. The bones indicate a perinate, while the dentition indicates an age of birth +/- two months. It is unlikely that this individual is more than two months old. Surface preservation of the skeletal material is good to fair with much of the material displaying only minimal taphonomic damage. Approximately 65.0% of the skeleton is present, including about 50.0% of the cranium. All the long bones are present, along with ribs, but the majority of the os coxae and vertebrae and all the bones of the hands and wrists and feet and ankles are missing. There were eight maxillary and five mandibular developing deciduous teeth examined, with only two in position in a mandible fragment. There is no evidence of dental pathology and there were no pathologies observed on the bones. These observations seem to agree with Lunt and Watt (1998: 113).

Grave 544

Grave 544 (KM3239) contains an infant aged three to nine months at death. There were no bones recovered from this grave. There were seven deciduous maxillary teeth and two deciduous mandibular teeth examined. All teeth are loose, still developing and display moderate levels of surface preservation with some pitting and erosion. There is no evidence of dental pathology on the teeth present. These observations agree with Lunt and Watt (1998: 113).

Grave 545

Skeleton A (KM2830) is an adult aged 24-32 years at death. Surface preservation of the skeletal material is moderate. Approximately 7.0% of the skeleton is present, including: a partial frontal bone, a fragment of left maxilla, a mandible in several fragments, a left lunate, a left fourth metacarpal, a left clavicle and fragments of a left femur. There were three maxillary and ten mandibular permanent teeth examined of which five mandibular teeth and two maxillary teeth are in position. The only pathology observed is a mild supragingival ridge of calculus on four of the teeth: the mandibular left first premolar, right central incisor and right canine and the maxillary left first premolar, which also displays unusual wear on the mesial aspect as it is twisted in the socket towards the canine. There were no other pathologies observed on the teeth or the bone. This analysis does not concur with Lunt and Watt's assessment of severe dental disease based on ante-mortem tooth loss of the left mandibular teeth from the canine to the second molar and over eruption of the maxillary left premolars. As well, the missing crown of the maxillary left canine is attributed to severe carious lesions (1998:113-4). The only explanation which can be arrived at is perhaps a different interpretation of the extent of the post-mortem damage to the left mandible. There is also no guarantee that in the intervening twenty years between assessments that there hasn't been some damage to the mandible while in storage.

Skeleton B (KM2827) is an adult female aged 22-30 years at death. The surface preservation of the skeletal material is moderate to poor. Approximately 20.0% of the skeleton is complete, including about 50.0% of the cranium. The only postcranial bones recovered are the highly fragmented long bones of one arm, a clavicle and right scapula, along with several hand bones and several rib fragments. There were 14 maxillary and eight mandibular permanent teeth examined plus several indeterminate root fragments. Only three left mandibular teeth and one left maxillary tooth are in position. There is a possible caries on the maxillary left first molar, though post-mortem damage makes this assessment somewhat difficult. And, there are mild to moderate supragingival calculus lines on the right maxillary third molar and left mandibular central incisor. None of the other teeth associated with this individual displays any calculus. The fragment of the left mandible displays *in vivo* tooth loss of the left first molar where the bone is still actively resorbing and porous. These observations agree with Lunt and Watt's assessment (1998: 113). There is no further evidence of dental pathology and there were no pathologies observed on the bones.

Grave 546

The adult within Grave 546 (KM1912) is a probable female aged 28-34 years at death. Surface preservation of the skeletal material is predominately moderate. Approximately 55.0% of the skeleton is present including about 25.0% of the cranium. The long bones of the arms are represented, while there is only a single tibia and fibula from the legs present. Almost all the vertebrae and most of the pelvic girdle and bones of the hands and wrists and feet and ankles are missing post-mortem as well. The bones of the left side of the body are much better preserved than the right. There were two maxillary and eleven mandibular teeth examined, of which only the right maxillary first premolar is loose. However, seven of the mandibular teeth which are in position have lost their crowns post-mortem and cannot be assessed for pathologies. The right side of the mandible exhibits an apical abscess exposing the roots of the first right mandibular molar. The right mandibular first molar, second and first premolars are very heavily worn. The attrition has worn into the pulp chamber of the first molar which has likely caused the infection at the apex of the tooth root. As well, it would appear that the third mandibular molars were either lost a long time prior to death or are congenitally absent. There is no other evidence of dental pathology and there were no pathologies observed on the bones. These observations agree with Lunt and Watt's assessment (1998:114).

Grave 548

The child within Grave 548 (KM1991) is aged three years +/-one year at death. Surface preservation of the skeletal material is fair to moderate. Approximately 40.0% of the skeleton is present including about 40.0% of the cranium. Only a humerus and two clavicles represent the upper limbs along with a few hand bones, while both femora, one tibia and a few foot bones are present for the lower limbs. There are no carpals or tarsals. All vertebral groups are present to some extent as are the ribs. However, the pelvic girdle is missing. There were seven deciduous and five developing permanent maxillary and ten deciduous and 11 developing permanent mandibular teeth examined, of which all but two maxillary teeth and six mandibular teeth are in position. There is no evidence of dental pathology and no pathologies were observed on the bones. These observations more or less agree with Lunt and Watt's, however with access to a radiograph to see the developing teeth within the mandible their age estimation is likely more accurate at three years +/- six months (1998: 114).

Grave 549

The infant within Grave 549 (KM 2011) is aged two years +/- eight months at death. Surface preservation of the skeletal material is fairly good with only some of the material displaying any erosion to the bone surface. Approximately 30.0% of the skeleton is present, including 75.0% of the cranium. All of the arm long bones are present, with only the left scapula and clavicle missing from the upper limbs. The cervical and thoracic vertebrae are present, along with the ribs and hand phalanges. The carpals and most metacarpals are missing. The lower half of the skeleton is missing. There are no bones below the ribs, with no lumbar vertebrae or pelvic girdle. The complete set of dentition (n=36) for an individual of this age is present. There were ten deciduous maxillary and mandibular teeth each and eight developing permanent teeth for each the maxilla and mandible examined. All but the mandibular right deciduous second molar and first permanent molar were loose. The only pathology recorded is a small patch of porosity observed on the exterior surface of the left parietal near the lambdoidal suture. There is no other evidence of porosity on any of the other cranial fragments and unfortunately, the frontal orbits are not preserved. Based on a lack of further evidence this patch of porous bone on the cranium could be from a number of metabolic disorders, infectious or hematopoietic diseases or an incidence of trauma. No other pathologies were observed on the teeth or bones. These observations more or less agree with Lunt and Watt's, though their age estimation is slightly younger (1998: 114).

Grave 550

The adult within Grave 550 (KM2005) is a female aged 32-42 years at death. Surface preservation of the skeletal material is moderate to poor with some erosion and discolouration on most of the material and several of the teeth are severely pitted. The bones are highly fragmentary and incomplete. Approximately 10.0% of the skeleton is present including about 20.0% of the cranium. The postcranial bone is represented by: a right scapula, a humerus, a radius, a femur, a tibia and several indeterminate long bones. There were eight maxillary, ten mandibular permanent teeth and a tooth with highly unusual morphology. This tooth represents a 'dilated odontome' according to Lunt and Watt (1998: 114). This is a developmental anomaly where the crown forms a large crumpled mass of enamel with no particular shape to it. It is asymptomatic and in this case it appears that at least a corner of it had broken through the surface of the soft tissue as there is a wear facet on one corner. Four molars, the left maxillary first and third and left mandibular second and third molars, display mild to severe supragingival calculus flecks and/or ridges. Most of the right molars are not present for comparison. The left maxillary second molar displays a carious lesion in the mesial aspect of the tooth at the cemento-enamel junction. Finally, the mandibular left and right first molars and the right canine display heavy attrition. There was no further dental pathology recorded and there were no pathologies observed on any of the bones.

Grave 551

The infant within Grave 551 (KM 2470) is aged 18 months +/- six months at death. Surface preservation of the skeletal material is moderate to poor, with the exception of the dentition which is in quite good condition. Approximately 40.0% of the skeleton is present, including about 60.0% of the cranium. Both humeri, the right radius and ulna, the left femur and tibia and a fibula are present, as are minimal cervical and thoracic vertebrae and ribs. There were no bones of the hands and wrists and feet and ankles recovered, nor was the majority of the pelvic girdle. There were ten deciduous and six developing permanent maxillary and nine deciduous and five developing permanent teeth examined. Of which, only a three of the posterior right maxillary and three of the left mandibular teeth are in position. There is no evidence of dental pathology. These observations agree with Lunt and Watt (1998: 114). Mild porosity was observed in the superior aspect of both frontal orbits, representing possible cribra orbitalia. None of the rest of the cranial fragments examined displayed any porosity and none of the long bones displayed any evidence of cortical thinning or porosity. The porosity in the orbits could be caused by a metabolic disorder or possibly an infectious or hematopoietic disease. No further pathologies were observed on the bones.

Grave 552

The subadult within Grave 552 (KM2053) is a third trimester foetus to a perinate, however this is based roughly on bone size and development as there were no teeth recovered. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration. Approximately 25.0% of the skeleton is present including: sphenoid fragments, the left radius, both femora, both ilia, the left fibula, both scapulae fragments and a phalanx and thoracic vertebrae fragments. No teeth were recovered therefore no assessment of dental disease was possible. There were no pathologies observed on the bones. As there were no teeth, Lunt and Watt do not comment on this individual (1998: 114).

Grave 554

The infant within Grave 554 (KM2269) is aged between birth and three months at death. However, the bones are small enough to reflect a third trimester foetus. Surface preservation of the skeletal material is moderate to poor. However, the dentition is in very good condition. Approximately 70.0% of the skeleton is present, including about 30.0% of the cranium. All the long bones are present except for one radius. Both clavicles and scapulae are present, as are most of the ribs. The lumbar vertebrae, hand and wrist and foot and ankle bones are completely absent, with the exception of one metacarpal. The cervical and thoracic vertebrae and one os coxa are partially represented. There were nine maxillary and three mandibular developing deciduous teeth examined. Of which, only the deciduous right second molar was in position in a fragment of mandible. There is no evidence of dental pathology. Overall, there is no evidence of pathology on any of the bones. However, the bones themselves appear quite porous in a way that does not look necessarily taphonomic. It could reflect a possible metabolic disorder, hematopoietic disease or general osteopenia. However, there is no further indication that any of these conditions are present within this individual. These observations on the dentition agree with Lunt and Watt (1998: 114).

Grave 555

The adolescent within Grave 555 (KM2384) has an estimated age of 12 years +/-30 months. Surface preservation of the skeletal material is fairly poor overall with severe erosion on many of the bones and consolidant obscuring the surfaces of the cranium. Approximately 35.0% of the skeleton is present, including about 20.0% of the cranium. Both radii, scapulae, clavicles, femora, patellae, tibiae and a fibula are present, along with the right ischium, three hand and five foot bones and vertebrae fragments from each group. The tarsals and carpals are completely absent, as are most of the ribs. There was one maxillary permanent tooth and seven mandibular permanent teeth examined, of which four teeth are in position in a fragment of the left mandible. There is no evidence of dental pathology and there were no pathologies observed on the bones. These observations on the dentition agree with Lunt and Watt's assessment (1998: 114).

Grave 556

The infant within Grave 556 (KM2303) is a third trimester foetus, based solely on the size and stage of development of the bones. Surface preservation of the skeletal material is fairly moderate with some erosion and discolouration. Approximately 10.0% of the skeleton is present. There are no teeth present and only minimal postcranial material including: a left femur, right tibia, indeterminate fibula, a hand phalanx, an indeterminate vertebra and an indeterminate long bone. There were no pathologies observed on the skeletal material. As there are no teeth this individual is not discussed by Lunt and Watt (1998: 114).

Grave 557

The adult within Grave 557 (KM2455) is a probable female aged 22-34 years at death. Surface preservation of the skeletal material is very poor with all the bones still concreted in compact soil which was not removed. This soil is very hard and compact due to the nature of the environment which is limestone and tends to leach into the organic material (for further discussion on the taphonomic processes on Cyprus see the discussion in Chapter Four). Approximately 65.0% of the skeleton is present, including 70.0% of the cranium which is *en bloc*. All long bones except the left radius and a tibia are present. Both scapulae and clavicles were recovered, along with most of the vertebrae from all three groups. The pelvic girdle is only partially represented and all carpals and most hand bones, foot bones and tarsals are absent. There were seven maxillary and six mandibular permanent teeth examined, of which five right maxillary and five right mandibular teeth are in position. The preservation of the teeth is remarkably good considering the condition of the bones. There is no evidence of dental pathology and there were no pathologies observed on the bones. These observations on the dentition agree with Lunt and Watt's assessment (1998:115).

Grave 559

The adult within Grave 559 (KM2315) is an adult female with a rough age estimation of 18-22 years based on the wear of only one molar. The surface preservation of the skeletal material is moderate. However, the bones are highly fragmentary making assessment difficult. Approximately 10.0% of the skeleton is present including: a mandible, seven tarsals, four metatarsals and several foot phalanges. There are also fragments of an os coxa, a tibia, a right radius, cervical vertebrae and several indeterminate bones which were too fragmentary to indentify. There were ten teeth examined, all of which are in position in the mandible with all but three missing their crowns. Therefore, it was not possible to assess the majority of the teeth. One proximal foot phalanx displays a bony growth on the lateral aspect of the proximal epiphysis. There is no evidence of trauma and none of the other five proximal foot phalanges display any pathology. There is no evidence of dental pathology and no pathologies were observed on any of the other bones. This grave is not included within the publication.

<u>Grave 560</u>

The infant within Grave 560 (KM2400) has an estimated age of nine months +/- three months at death. Surface preservation of the skeletal material is moderate to poor with some severe erosion and discolouration of the bones. The teeth are in fairly good condition. There is some discrepancy in the aging of the infant as the bones are very small and seem to reflect a perinatal infant while the dental age is slightly older. As this individual died quite young, it seems plausible that bone growth was retarded due to poor health which could have any number of causes. The skeleton of the infant is approximately 40.0% complete including about 10.0% of the cranium. Most of the long bones are present, with an ulna, a femur and fibula missing. There are two metatarsals. However, the rest of the foot and ankle and hand and wrist bones are completely absent, as are all the vertebrae, most of the ribs and most of the pelvic girdle. There were 12 maxillary and ten mandibular deciduous teeth, developing permanent mandibular first molar and an unidentified tooth root examined, of which only three left mandibular deciduous teeth are in position. There is no evidence of dental pathology and there were no pathologies observed on the bones. These observations on the dentition agree with Lunt and Watt (1998: 115).

<u>Grave 561</u>

The adult within Grave 561 (KM2338) is a probable female aged 20-32 years at death. Surface preservation of the skeletal material is good to moderate with erosion and discolouration on most of the material to variable degrees. Approximately 95.0% of the skeleton is present, including 70.0% of the cranium. While the bones are moderately fragmented, the only bones missing in their entirety are a few carpals, distal hand phalanges, tarsals, foot phalanges and one metatarsal. The permanent dentition is complete (n=32) and in position, with the exception mandibular left third molar which is loose. Therefore, the majority of the mandible and maxillae are present as well. This individual displays minimal pathological expression throughout the skeleton. All four of the canines display a mild LEH in the cervical third of the crown, reflecting a period of stress in childhood while the canine crowns were forming. Three maxillary and four mandibular teeth exhibit supragingival calculus, which for the most part is mild. However, the mandibular central incisors and right lateral incisor display moderate calculus accumulation on the lingual aspect of the tooth crown. There were no dental caries observed however mild alveolar recession was noted on the maxillary dentition, best seen on the left molars buccal aspect. There is no evidence of any more dental pathology. These observations are similar to Lunt and Watt, but they do not discuss calculus and have observed a small carious lesion on the distal aspect of the mandibular first molar (1998: 115).

Postcranial pathologies, in the form of osteoarthritic changes, were observed on two metatarsals and two foot phalanges of the individual in Grave 561. Both the right and left fifth metatarsals display extension of the medial facet of the proximal epiphysis with mild osteophytic growth on along the facet margin. None of the other seven metatarsals are affected with any osteoarthritic changes or any other pathology. There is no evidence of trauma on any of the metatarsals or recovered tarsals. The right first proximal and distal foot phalanges both display mild osteoarthritic changes in the form of osteophytes on margins of the proximal epiphyses. Neither the right first metatarsal nor the left proximal first foot phalanx displays any osteoarthritic changes, which indicates that the mild degenerative bone growth on the margins of the articular facets is localised. There is no evidence of trauma. No further pathologies were observed on any of the bones.

Grave 562

The adult within Grave 562 (KM2636) is a female with a tentative age of 18-22 years at death. Surface preservation of the skeletal material is for the most part moderate with some erosion and discolouration. Approximately 50.0% of the skeleton is present, including about 75.0% of the cranium. The left side of the skeleton is better represented than the right side. The right radius, ulna, scapula, tibia and fibula are missing, along with all the right foot and ankle bones and os coxa. There are no carpals or hand bones present and the minimal vertebrae and os coxa present are highly fragmentary. The cranium is still *en bloc* with soil filling the interior. There were seven maxillary and ten mandibular teeth examined. Of which, four mandibular teeth were in position in several mandible fragments, with the rest of the teeth loose. A radiograph is needed to be certain, but it seems that the third molars are congenitally absent. Several teeth display one or more LEH. Both mandibular canines display two mild LEH both in the cervical third of the tooth crown. As well, the maxillary left first premolar, the mandibular left first and right second premolars all display one LEH in the cervical third of the tooth crown. The maxillary left canine and neither of the maxillary second premolars display a LEH. The maxillary right canine and first premolar were not recovered. Therefore, it is possible that the expression of the LEH represents either localized stress during tooth crown formation or perhaps a general physiological stress which did not manifest itself on all the teeth developing at the time. Lunt and Watt's assessment does not include observations of LEH, however the age estimation is similar (1998: 115). There is no further evidence of dental pathology and there were no pathologies observed on the bones.

<u>Grave 563</u>

Skeleton A (KM 2718) is a child aged three to five years at death. Surface preservation of the skeletal material is good to moderate. The teeth are in very good condition. Approximately 75.0% of the skeleton is present, including about 40.0% of a fragmentary cranium. All the arm long bones are present. However, one femur, one tibia and one fibula are missing, while the other leg bones are highly fragmentary. The right scapula is missing, as are all the carpals and tarsals and most of the hand and foot bones. The vertebrae, pelvic girdle and ribs are represented to some degree though highly fragmentary. The cranium is labelled as 'A+C' and most likely belongs to Skeleton A. There were ten deciduous and 14 developing permanent maxillary and nine deciduous and five developing permanent mandibular teeth examined along with two unidentified root fragments. Two deciduous maxillary teeth and all but the two deciduous mandibular canines are in position. There is a small patch of new bone growth on the anterior aspect of the distal third of the right humerus. This is not observed on the left humerus, nor is there any evidence of roughened bone growth on the right radius or ulna. There is no evidence of fracture. While it is impossible to be certain, this may reflect a minor blunt trauma. There is no evidence of dental pathology and there were no other pathologies observed on the bones. This age assessment is slightly older than Lunt and Watt's (1998: 115).

Skeleton B (KM2719) is an infant aged 18 months +/- six months at death. Surface preservation of the skeletal material is quite good with only very mild taphonomic damage on the bones. The teeth are in fairly good condition. Approximately 50.0% of the skeleton is present, including about 30.0% of a fragmentary cranium. All of the right arm long bones are missing, as is one femur and one tibia. Phalanges are well represented, though fragmentary and unidentifiable in most cases. While both clavicles, several metacarpals and metatarsals are present, all carpals and tarsals are completely absent along with almost all the vertebrae, ribs and pelvic girdle. The cranium is labelled as 'B+D' and most likely belongs to Skeleton B. There were ten deciduous and six developing permanent maxillary and ten deciduous and seven developing permanent mandibular teeth examined, all of which are loose. There is no evidence of dental pathology. The only pathology observed is a patch of porotic hyperostosis with thickening and porosity on the external surface of a parietal fragment. There is only one small patch observed and the orbits of the frontal were not preserved enough to assess for porosity. There is no other evidence of porosity of the cranium or postcranial bones. This patch of porosity could have a number of different aetiologies, from a localized issue with capillary expansion to metabolic disorders or hematopoietic diseases to minor trauma. There is no evidence that conclusively suggests any particular cause, as there were no other pathologies observed. This age assessment is slightly older than Lunt and Watt's (1998:115).

Skeleton D (KM2719.02) is an infant aged two years +/- eight months. This individual seems to be represented by four teeth: a right deciduous maxillary central incisor, both maxillary deciduous canines and an indeterminate tooth root. Surface preservation of the teeth is very good. While Lunt associates the central incisor with another individual based on slightly heavier wear a more conservative approach was taken for this study given that there is discrepancy in eruption times for the Cypriot populations. The root of the tooth is also damaged which makes assessment of tooth development difficult to be precise. There is no evidence of dental pathology on any of the recovered teeth from Skeleton D. This age assessment is similar to the one given for the miscellaneous teeth described by Lunt and Watt (1998:115).

Grave 564

See grave description.

Grave 565

The adult within Grave 565 (KM2887) is a probable male based on the left gonial angle and most likely over the age of 25 years at death based on the complete fusion of the sternal epiphysis of the right clavicle. Surface preservation of the skeletal material is very poor with most surfaces obscured. Approximately 10.0% of the skeleton is present with no teeth recovered. The only bones present are: a fragment of left mandible, indeterminate cranial fragments, thoracic vertebrae fragments, a left humerus, a radius, an ulna, two clavicles, a right scapula, several ribs and a femur fragment. None of the bones could be assessed for pathologies. As there are no teeth, Lunt and Watt record only the presence of the left mandible fragment (1998: 115).

Grave 566

The child within Grave 566 (KM2693) is six to ten years of age at death. Surface preservation of the skeletal material is good to moderate with some mild erosion and discolouration on most of the material. Approximately 55.0% of the skeleton is present, including about 75.0% of the cranium. The majority of the upper body is missing with only the left radius representing the arm long bones, the first cervical vertebra and no lumbar vertebrae, minimal rib and thoracic vertebrae fragments present. There are no pelvic bones or carpals and neither shoulder girdle. There are several metacarpals and hand phalanges and the leg long bones present, along with one tarsal, several metatarsals and foot phalanges. There were five deciduous and eight developing permanent maxillary teeth and three deciduous and 11 developing mandibular teeth examined. Of which eleven are in position, five in the mandible and six in the maxilla. The left deciduous first mandibular molar is heavily worn, while the right deciduous first mandibular molar was not recovered, the left deciduous second molar displays moderately heavy wear as well. The only pathology observed is porosity in the superior aspect of the frontal orbits, cribra orbitalia. The extent of the porosity is difficult to assess as post-mortem damage has broken the orbits. There was no porosity observed on the right parietal which was recovered and no visible thinning of the cortex of the long bones. No further porosity was observed on any of the bones. Therefore, the cause of the porosity within the orbits could be from a number of metabolic disorders or infectious or hematopoietic diseases. There is no evidence of dental pathology and there were no further pathologies observed on the bones. These observations on the dentition agree with Lunt and Watt (1998: 115).

Grave 567

The individual within Grave 567 (KM2835) is most likely an adolescent aged ten to twelve years at death. Surface preservation of the skeletal material is moderate with some erosion and discolouration. The teeth are in fairly good condition. Providing an age estimation for this individual was a bit difficult as there are some anomalies in the tooth eruption time. This is highlighted by Lunt and Watt and with the use of radiographs she was able to determine that there is congenital absence of a second mandibular premolar and third mandibular molars. As well, the other second mandibular premolar is embedded (1998: 115). Approximately 80.0% of the skeleton is present including a well conserved cranium which is approximately 90.0% complete but missing predominately the endocranial bones. Both ulnae are missing post-mortem but all other long bones are accounted for. There is relatively good representation of the bones of the hands and feet and ankles, though all the carpals are missing. The ribs, vertebrae and os coxae are all present and fairly complete. There were 13 maxillary and 11 mandibular permanent teeth examined, plus the mandibular deciduous second molars. Two left maxillary teeth, six mandibular permanent teeth and the two deciduous teeth are in position.

Half the recovered teeth display mild hypoplastic defects to the enamel. All four canines are affected with two or more mild LEH in the cervical and middle thirds of the teeth. As well, the maxillary central incisors each display three LEH, as does the maxillary right canine. The maxillary left first premolar and right lateral incisor display one LEH, as do the mandibular right and left first premolars, the right and left lateral incisors and the left central incisor. All together 13 teeth display LEH, representing at least three periods of physiological stress in this individual's life while the teeth were forming. Unusually, there is not always bilateral tooth type expression. Several teeth display the defect on their opposing tooth, but not in all cases, which possibly reflects either localised stresses causing some of the defects or perhaps different susceptibility or reactions to general physiological stresses. Four teeth display mild supragingival calculus on their surfaces: the left lateral and central mandibular incisors and the right maxillary second premolar and second molar. Calculus was not observed on any of the adjacent teeth. Both deciduous molars are heavily worn as would be expected. Lunt and Watt did not observe the LEH and do not record calculus representing a discrepancy in observations (1998: 115).

The left frontal orbit displays very mild porosity in the superior aspect, possible cribra orbitalia. The frontal bone of the cranium is almost complete and intact however, the right orbit has not been completely excavated so it is impossible to assess if this affects both sides. This porosity does not seem to appear on any of the other cranial bones, in particular the parietals do not display any porosity on the exterior surface of the bone. The right radius appears to be bowed. There is exaggerated curvature of the right radius laterally at the mid-diaphysis. This is not reflected on the left radius and both ulnae are absent. There are no obvious signs of trauma, but a radiograph would be helpful in determining whether this is the case. As the right radius is the only bone affected with this change in morphology it seems unlikely that there is any general disorder or disease causing this, but it cannot be ruled out. Overall, the cribra orbitalia in association with the bowing of the right radius could reflect a possible metabolic disorder, hematopoietic disease or vitamin or mineral deficiency. Equally, they could occur independently of each other. Therefore, the aetiology of these pathologies is not ascertained.

Grave 569

The infant within Grave 569 (KM2948) is aged nine months +/-three months at death. Surface preservation of the skeletal remains is moderate however the teeth are in very poor condition. Approximately 7.0% of the skeleton is present, including: indeterminate and occipital cranial fragments, mandible fragments, a clavicle, a metacarpal, several hand phalanges, a tibia and several ribs. There were nine maxillary and eight mandibular deciduous teeth and two developing first maxillary molars examined, all of which are loose. None of the teeth could be assessed for pathologies and there were no pathologies observed on the bones. These observations on the dentition agree with Lunt and Watt (1998:116).

Grave 570

The infant within Grave 570 (KM2979) has an estimated age of birth +/- two months at death. Surface preservation of the skeletal remains is moderate and the teeth are in fairly good condition. Approximately 50.0% of the skeleton is present, including about 30.0% of the cranium. All the arm long bones are present, as is one femur and one tibia. Both scapulae, the pelvic girdle, cervical and lumbar vertebrae and all carpals and tarsals are missing. There are several hand and foot bones and ribs present. There were four maxillary and three mandibular developing deciduous teeth examined, all of which are loose. There is no evidence of dental pathology and no pathologies were observed on the bones. The age assessment given here is slightly younger than that estimated by Lunt and Watt (1998: 116).

Grave 571

The adult within Grave 571 (KM3079) is a female with a possible age at death of 22-48 years, based on a combination of molar wear, suture closure and the auricular surfaces of the os coxa. Surface preservation of the skeletal material is moderate with some erosion and discolouration. The age estimation is difficult due to severe dental disease affecting the teeth and the taphonomic processes affecting the auricular surfaces. However, given the extent of the dental disease and heavy wear on the anterior teeth, this individual must have been a mature adult. Approximately 90.0% of the skeleton is present, including 70.0% of the cranium which has been restored using a clear consolidant and is missing most of the facial and endocranial bones. Overall, the preservation and recovery of this individual is quite good, with only a right patella and a few of the bones of the hands and wrists and feet and ankles missing. The vertebrae are in remarkably good condition with almost all the cervical vertebrae preserved and the first through seventh thoracic vertebrae present. There were four maxillary, 11 mandibular in position teeth and one loose indeterminate tooth examined.

The mandible is severely affected with pathological lesions. All anterior teeth have cavities at their root apices and the bone is porous and has likely developed into a general osteomyelitis. The left first premolar, canine, lateral and central incisors as well as the right central incisor are all worn down into the pulp chamber and in two cases there is only a root stump left. The right lateral incisor, canine and first premolar were all lost *in vivo* and show evidence of continued infection and remodelling of the alveoli. The first and second mandibular molars from both sides are present with minimal wear. They are over-erupted, hanging onto the alveoli by the ends of their roots. The mandibular third molars appear to be congenitally absent. The reason for this unusual wear pattern is clear when the maxilla is examined. Both the premolars and all the molars from the left side of the maxilla and the second premolar and all the molars from the right side of the maxilla have been lost ante-mortem. Therefore, there were no occluding teeth in the posterior half of the mouth, putting the load of mastication on the anterior teeth. This created the severe wear on the anterior teeth recorded above which, once worn into the pulp chambers likely caused many of the apical abscesses and allowed the over-eruption of the mandibular molars. The maxillary molars were likely lost some time before death as the alveolar bone is totally resorbed, while the alveoli of left first and second premolars and the right second premolar are still active with large apical cavities. The left central maxillary incisor was lost *in vivo*, possibly almost perimortem as there is still active resorption and a very small socket. Both maxillary canines have small apical abscesses and the left tooth displays heavy attrition into the pulp cavity lingually while a portion of the labial surface of the crown survives and displays a mild LEH in the cervical third of the crown. The three remaining maxillary incisors are heavily worn. All together there are seven chronic apical abscesses most likely due to heavy wear opening the pulp chamber which had lead to infection. Mild to severe subgingival and supragingival calculus is observed on the maxillary right central and lateral incisors and the mandibular first and second molars. It is possible that the maxillary third molars are congenitally absent. There is no evidence of dental caries. All of these observations agree with Lunt and Watt's assessment (1998: 116).

Postcranial pathology seems comparatively mild in light of the extensive dental disease. The cervical vertebrae are mostly complete from the first to the seventh and in very good condition. The second cervical vertebra displays osteophytic growth on the superior aspect of the dens (where the apical ligament attaches) and some porous bone growth at the spinous process. Four of the cervical vertebrae display osteoarthritic changes, two are affected with a bony growth of the tip of the spinous process and osteophytic growth at the margins of the body, particularly on the superior aspect and the spongy bone of the vertebral bodies appears slightly porous. The other two are missing their spinous process post-mortem but display the same mild bony growth on the margins of the vertebral body and porosity of the spongy bone. In all of the thoracic vertebrae and several cervical vertebrae the cortical bone of the body forms very clearly delineated line on superior and inferior surfaces which is slightly raised and thicker as if spongy interior bone is compressed. The lumbar vertebrae are not as well preserved as the upper parts of the spine and are more fragmented. Several lumbar vertebral articular facets display quite severe extension of the articular surface with osteophytic growth at the margins and one body fragment has small osteophytes projecting from the anterior aspect. Overall, these changes to the vertebrae reflect osteoarthritic changes to the majority of the spinal column. The bony growth on the spinous processes possibly reflects modification based on attachment to the nuchal ligament which runs from the external occipital protuberance to spinous process of the seventh cervical vertebra and acts as a septum for the muscles on either side of the neck. There is no evidence of trauma on any of the vertebrae, nor on any of the long bones which may effect movement.

The right hand and indeterminate foot phalanges also display osteoarthritic changes to their articular surfaces. The right first metacarpal displays a proximally directed osteophytic growth on a condyle on the plantar aspect of the distal epiphysis. While this is not observed on the left first metacarpal, an indeterminate first proximal hand phalanx displays mild osteophytic growth extending the articular surface of the proximal epiphysis. As there is no evidence of trauma, it seems likely that the left first digit of the hand displays localized, unilateral, mild degenerative joint disease. Finally, one proximal foot phalanx and two intermediate foot phalanges display osteoarthritic changes to the articular surfaces and in the case of the intermediate phalanges, remodelling. The distal epiphysis of the proximal phalanx displays a small osteophyte on the dorsal aspect reflecting a possible poor articulation, while the proximal epiphyses of the intermediate phalanges show osteophytic growth around the margins of the proximal epiphysis and the diaphyses are thickened and compressed. These changes are possibly due to trauma, though there is no obvious evidence of fracture and a radiograph would be required to determine this. It seems that at least one foot was affected by mild degenerative changes to the toe joints.

None of the other three proximal foot phalanges exhibit any pathology and these are the only two intermediate foot phalanges recovered.

Grave 572

The infant within Grave 572 (KM3465) is aged two years +/- eight months at death. Surface preservation of the skeletal material is predominately moderate. Approximately 45.0% of the skeleton is present including about 50.0% of the cranium. Both humeri, the left ulna, right scapula, right femur and lumbar vertebrae are missing, as are all the carpals. There is one tarsal and most of the cervical vertebrae present. However, most of the hand and foot bones are absent. The os coxae, ribs and thoracic vertebrae are present though rather incomplete. There were only two teeth examined, a developing maxillary second molar and an indeterminate molariform. There is no evidence of dental pathology and there were no pathologies observed on the bones. Lunt and Watt's assessment of the dentition also includes a maxillary right central permanent incisor which was not present for this study (1998: 116).

Grave 573

The child within Grave 573 (KM3476) is aged five years +/- 16 months at death. Surface preservation of the skeletal material is good to moderate with only little to no taphonomic damage on many of the bones. Approximately 55.0% of the skeleton is present, including about 80.0% of the cranium. The postcranial bones are quite fragmentary despite their good surface preservation and tooth surface preservation is variable. The left side of the body is much better preserved, with all right long bones except the femur absent. There are only minimal cervical and thoracic vertebrae and os coxae fragments present, along with the ribs and both clavicles. Both scapulae and most of the hand and wrist and foot and ankle bones are missing. There were seven deciduous and ten developing permanent maxillary teeth and six deciduous and ten developing permanent mandibular teeth examined plus one indeterminate tooth. Four maxillary and four mandibular teeth are in position. The only pathology observed for this individual is LEH, which is noted with two incidences in the cervical third of both maxillary central incisors. None of the other teeth display a hypoplastic defect. This reflects a period of physiological stress in the individual's life while the tooth was forming. This assessment mostly agrees with Lunt and Watt who also note a single line at the cemento-enamel junction of the developing first permanent molar (1998: 116). There were no pathologies observed on the bones.

Grave 574

The adult within Grave 574 (KM3478) is a probable male aged 21-46 years at death, though based on the dentition the lower end of this range is more appropriate, 21-28 years. Surface preservation of the skeletal material is predominately moderate. Approximately 75.0% of the skeleton is present, including about 75.0% of the cranium. All of the long bones are present. The left clavicle and scapula, several ribs, all but one of the carpals and most of the tarsals, most of the os coxae and all the thoracic and lumbar vertebrae are missing. Many of the hand and foot bones are present. There were ten maxillary, 13 mandibular teeth and one indeterminate tooth examined. Of which, 18 teeth are in position but only five still have their crowns with the others were broken post-mortem and hence cannot be assessed for pathologies. Five mandibular teeth, from the left second premolar to the right central incisor, display calculus, as do the maxillary left central incisor and the right lateral incisor. While mostly mild to moderate expression, the central mandibular incisors exhibit severe supragingival calculus ridges covering most of the labial or lingual surfaces of the crown. There is a small bone growth on the external surface of the occipital superior to the external occipital protuberance. The growth is unusual in shape, rather small, flat and circular and most likely asymptomatic during life. Unsure of the aetiology, it may possibly be a small osteoma or perhaps simply accentuation of the neck muscle attachments which extend up the back of the cranium or a possible non-metric variation or even a possible reactive bone growth to an incidence of trauma which was suffered long before death. There is no further evidence of dental pathology and there were no further pathologies observed on the bones. The observations on the dentition are similar to Lunt and Watt in regards to teeth present, but they do not discuss calculus (1998: 116).

Grave 575

The infant within Grave 575 (KM3521) is aged two months +/- two months. Surface preservation of the skeletal material is predominately moderate. Approximately 80.0% of the skeleton is present including about 80.0% of the cranium. All of the long bones are present and in very good condition with minimal fragmentation with some consolidation which has not obscured the surface of the bone. While none of the foot bones, tarsals or carpals are present, all vertebral groups are moderately represented as are the hand bones. The ribs and both os coxae are partially present and the right scapula is absent. There were four maxillary and ten mandibular developing deciduous teeth examined. All the mandibular teeth are in position as is the deciduous maxillary left second molar, while the other three maxillary teeth are loose. There is no evidence of dental pathology and there were no pathologies observed on the bones. Lunt and Watt's age assessment is slightly older than the one provided here, but agrees with the rest of the observations (1998:116).

Appendix I: Description of the skeletal remains by discrete mortuary feature derived from Kissonerga-*Mosphilia* with focus on the palaeopathology

**Note please that unless otherwise indicated, age estimation was based on molar wear (Miles 1963) or dental development (Ubelaker 1989) and sex assessment was almost solely based on cranial features (Buikstra and Ubelaker 1994). If the pelvic bones were present, sex was assessed based on them (Brooks and Suchey 1990; Phrenice 1969).

Overall, 62 discrete mortuary features with a minimum of 80 individuals (MNI) were studied for the settlement site of Kissonerga-*Mosphilia*. What follows is a grave by grave description of the human remains recovered and assessed with particular reference to any pathological lesion. The various types of mortuary feature are discussed by Lunt, Peltenburg and Watt in the publication for Kissonerga-*Mosphilia* (1998: 65-92). This appendix provides a general synopsis of each grave examined, for details regarding each discrete skeleton observed at Kissonerga-*Mosphilia*, refer to Appendix H.

Grave 501

Grave 501 (KM369) contains the remains of at least one subadult. Surface preservation of the skeletal material is fair. Overall, 10.3% (n=4) of the skeletal material cannot be assessed for pathologies. The child has an estimated age of two to four years at death. No pathologies were noted on the material.

Grave 502

Grave 502 (KM560) contains at least one subadult. Surface preservation of the skeletal material is moderate. Overall, 55.6% (n=5) of the skeletal material cannot be assessed for pathologies. The estimated age of the child is one year +/- four months at death. There were no pathologies observed.

Grave 504

Grave 504 (KM 559) is a pithos burial and contains at least one subadult. Surface preservation of the skeletal material is quite poor, as most of the surfaces are obscured with consolidant. Overall, 54.2% (n=26) of the skeletal material cannot be assessed for pathologies. The estimated age of the child is five years +/- 16 months at death. There were no pathologies observed.

Grave 505

Grave 505 (KM553) is a multi-chambered tomb containing at least four individuals. Surface preservation of the skeletal material is predominately moderate. However, the teeth are in quite good condition. Overall, 37.2% (n=64) of the skeletal material cannot be assessed for pathologies. Skeleton A is an adolescent aged 16-22 years at death. Skeleton B is an adult possibly female. Skeleton C is an adult aged 22-28 years at death. Skeleton D is recorded by Lunt and Watt (1998: 109) as a child aged 10 years +/- nine months, however, no dentition was found during the current assessment to support this. Recording of the skeletal material varies and in some cases it is impossible to associate a particular skeletal element with a particular individual. Twenty-three bones and one mandibular incisor were recovered without a specific context. Of this material, only one bone displays pathology, a distal foot phalanx has osteophytic growth projecting from the diaphysis just inferior to the distal epiphysis. This may reflect trauma, resulting in bone growth, though there is no evidence of a fracture.

Overall for Grave 505, at least one individual displays osteoarthritic changes to the spine and one rib. The only left first metatarsal recovered and one distal foot phalanx each display osteoarthritic changes, reflecting at least one individual within the tomb. At least individual was affected with mild osteoarthritic changes to the distal epiphysis of the right ulna, which was the only ulnar distal epiphysis recovered.

Grave 506

Grave 506 (KM571) is a part of the mortuary enclosure 375 and contains at least one adult individual, as there is no duplication of elements. Surface preservation of the skeletal material within this grave is moderate to poor. Overall, 43.1% (n=53) of the skeletal material cannot be assessed for pathologies. The skeleton of a female adult aged 18-26 years at death was examined. An unfused proximal epiphysis of a femur and a tibia were recovered which possibly indicates the presence of a younger individual. However, given that there were no epiphyseal ends recovered for any of the other long bones, they may belong to this individual. Only one tooth of a complete adult dentition displays mild calculus and at least one foot, affecting two foot phalanges displays possible trauma or a congenital ankylosis of the foot phalanges.

Grave507

Grave 507 (KM766) is part of mortuary enclosure 375 and contains at least one child. The surface preservation of the skeletal material is moderate. Overall, 29.1% (n=23) of the skeletal material cannot be assessed for pathologies. The skeleton of a child aged five to nine years at death was examined. Two teeth display an incidence of LEH. There were no pathologies observed on the bones.

Grave 508

Grave 508 (KM662) contains at least one individual as there is no duplication of any skeletal elements. The surface preservation of the skeletal material is very poor. Overall, 36.6% (n=15) of the skeletal material cannot be assessed for pathologies. The individual is an adult male aged 24-30 years at death. There is no evidence of dental disease and no pathologies were observed on the bones.

Grave 509

Grave 509 (KM663) contains a minimum of two infants with the duplication of the deciduous right maxillary second molar. Surface preservation of the skeletal material within the grave is moderate to poor with eroded and discoloured surfaces. Overall, 62.5% (n=15) of the skeletal material cannot be assessed for pathologies. Skeleton A is an infant aged six months +/- three months at death. Skeleton B is an infant aged six months to a year at death, represented solely by an intrusive deciduous right maxillary second molar. There are no pathologies observed, though Lunt and Watt record a ‘tubercle of Carabelli’ on the crown (1998:110).

Grave 510

Grave 510 (KM624) contains at least one child. Surface preservation of the skeletal material within the grave is overall quite fair. Overall, 11.5% (n=7) of the skeletal material cannot be assessed for pathologies. The individual is a child aged four to eight years at death. There is no evidence of dental disease and there were no pathologies observed on the bones.

Grave 513

Grave 513 (KM767) contains at least one subadult. Surface preservation of the skeletal material within the grave is moderate to poor. Overall, 18.8% (n=12) of the skeletal material cannot be assessed for pathologies. The individual is an infant aged two years +/- eight months. There is no evidence of dental disease and there were no pathologies observed on the bones.

Grave 514

Grave 514 (KM875) contains at least one subadult and one adult. Surface preservation of the skeletal material is quite good. There is only a very small amount of human bone associated with this tomb. The grave is located in a possibly disturbed area just outside of building 4 of the Middle Chalcolithic period. The subadult is represented by a fragment of the frontal bone and a rib fragment. The adult is represented by two proximal hand phalanges and a fourth metacarpal. There were no pathologies observed on any of the bones. This grave is not discussed by Lunt and Watt and the grave synopsis includes an assessment of a male adolescent individual, the remains of which could not be located for this study (1998: 89).

Grave 515

Grave 515 contains the remains of at least three individuals. Surface preservation of the skeletal material is predominately moderate with some elements consolidated with dirt. Overall, 31.9% (n=46) of the skeletal material cannot be assessed for pathologies. There are two adults and one subadult, indicated by duplication of a number of teeth and the left zygomatic. All of the skeletal material was mixed together in storage and there is some confusion in assessing which elements belong to which individual as both seem to be similar age and size. As well, there were two small finds numbers assigned to this tomb and there is some confusion as to which teeth belong to which individual. All material which could be attributed to a particular individual was separated. The subadult is represented only by an indeterminate unfused epiphysis and several rib fragments. Skeleton A is a probable male aged very roughly 24-35 years at death. Skeleton B is an adult aged very roughly to 26-32 years at death. Both individuals display supragingival calculus and dental caries. One individual displays osteoarthritic changes to the ribs and one individual displays LEH.

Grave 516

Grave 516 (KM768) contains at least one subadult. Surface preservation of the skeletal material within this grave is moderate to poor. Overall, 42.2% (n=27) of the skeletal material cannot be assessed for pathologies. The individual is a child aged four to eight years at death. There is no evidence of dental disease and there were no pathologies observed on the bone.

Grave 517

Grave 517 (KM 855) contains at least one subadult. Surface preservation of the skeletal material is moderate to poor. Overall, 63.6% (n=14) of the skeletal material could not be assessed for pathologies. The individual is an infant aged two years +/- eight months at death. There is no evidence of dental disease and there were no pathologies observed.

Grave 518

Grave 518 (KM981) contains at least one infant. Surface preservation of the skeletal material is predominately moderate though highly fragmentary. Overall, 33.3% (n=7) of the skeletal material cannot be assessed for pathologies. The estimated age of the infant is nine months +/- three months. There is no evidence of dental disease and there were no pathologies observed.

Grave 519

Grave 519 (KM1065) contains at least one subadult. Surface preservation of the skeletal material is predominately moderate. The teeth represent 47.1% (n=5) of the skeletal material recovered from the grave, none of which could be assessed for pathologies. The estimated age of the individual is five years +/- sixteen months. None of the cranial bones displayed any pathology.

Grave 520

Grave 520 (KM1066) contains at least one adult. Surface preservation of the skeletal material is predominately moderate with some erosion and discolouration of the bone surface. Overall, 34.8% (n=8) of the skeletal material cannot be assessed for pathologies. The individual is an adult female aged 34-38 years at death. There is no evidence of dental pathology and there were no pathologies observed in the bones.

Grave 521

Grave 521 (KM1044) contains at least two individuals as evidenced by the duplication of several teeth at different tooth development stages. Surface preservation is fairly moderate with some erosion and discolouration of the bone surfaces. Overall, 15.4% (n=12) of the skeletal material cannot be assessed for pathologies. There are very few postcranial bones included within the grave and since both individuals are close in age it is impossible to determine which one the bones belong to. Skeleton A is a child aged eight years +/- two years at death, represented by a cranium, mandible and dentition. Skeleton B is a child aged three to five years at death, represented by a mandible fragment and five teeth. The rest of the bones within the grave are predominately postcranial (barring a few more mandible fragments and two teeth), with no duplication of elements. Approximately 15.0% of the skeleton is present, including a right humerus and radius, an indeterminate humerus and radius, two clavicles, a scapula, several hand bones, a few cervical and thoracic vertebrae including an atlas, two ilia, a femur, a fibula and two foot phalanges. The permanent left first mandibular molar displays a mild supragingival ridge of calculus on the lingual aspect. There were no pathologies observed on the bones. At least one individual displays mild supragingival calculus.

Grave 522

Grave 522 (KM1045) contains at least one older child. Surface preservation is fair with minimal taphonomic damage. Overall, only 14.0% (n=6) of the skeletal material cannot be assessed for pathologies. The individual is an older child aged ten years +/- thirty months at death. There is no evidence of dental disease and there were no pathologies observed on the bones.

Grave 524

Grave 524 (KM922) contains at least one subadult. Surface preservation of the skeletal material is fair. Overall, 9.5% (n=7) of the skeletal material cannot be assessed for pathologies. The individual is an infant aged two years +/- eight months. Two of the deciduous anterior teeth display mild supragingival calculus.

Grave 525

Grave 525 (KM923) contains the remains of at least two subadults. Surface preservation of the skeletal material within this grave context is quite good with minimal taphonomic damage. Overall, 20.5% (n=8) of the skeletal material cannot be assessed for pathologies. Skeleton A is an infant aged two years +/- eight months at death, represented only by teeth and a mandible fragment. Skeleton B is a child aged four to eight years at death and is represented conclusively by six loose teeth. It seems most likely that the cranial and postcranial bone within the grave belongs to the older individual. However, due to mixing of the postcranial material it is impossible to be certain. Based on the size and developmental stage, the bones are from an individual around five years of age. There are two pits within the tomb, the lower pit contained the cranial bone and upper bit seems to be predominately the postcranial bone. All the bones could be from the same individual and there is no duplication of bone elements. If the bones are all from the same individual, the skeleton is only approximately 15.0% complete as it is missing all the long bones, except the right ulna and both fibulae, as well as the majority of the bones of the hands/wrists and feet ankles, along with the pelvic girdle. Very few cervical and thoracic vertebrae, one clavicle, several ribs and minimal cranial fragments are present. There were no pathologies observed on any of the bones. Lunt and Watt provide an MNI of three for Grave 525 (1998: 112). Lunt and Watt determine that Skeleton B is between four to five years of age at death based on the maxillary left first molar and Skeleton C is six years +/- eight months old at death based on a permanent maxillary left second molar, left second premolar and left canine. However, it seems that because the left maxillary first molar is broken at the roots that it is possible to belong to the same individual (Skeleton B) as the other teeth and based on tooth developmental variation within Cypriot populations it seems reasonable to be conservative and estimate a MNI of two. The preservation level of the left maxillary first molar is different from other teeth with less discolouration and surface damage but doesn't necessarily preclude from same individual. There were no pathologies observed.

Grave 526

Grave 526 (KM1175) contains at least three individuals. Surface preservation of the skeletal material is predominately good to moderate, however some bones are treated with consolidant and obscured. Overall, 24.2% (n=66) of the skeletal material could not be assessed for pathologies. Skeleton A is an adult female aged 18-24 years at death. Skeleton B is an adolescent aged 15 years +/- 36 months. The third individual is represented by two intrusive teeth, a right mandibular second molar and lateral incisor. Overall within Grave 526, two individuals display supragingival calculus. Only one of the two individuals with postcranial bones within the grave displays a dental caries, LEH and osteoarthritic changes of the axis, one carpal, one tarsal and one metatarsal.

Grave 527

Grave 527 (KM1218) contains at least one subadult. Surface preservation of the skeletal material is moderate with some erosion and discolouration of the bones. Overall, 22% (n=11) of the skeletal material cannot be assessed for pathologies. The individual is a child aged two to four years at death. There was no evidence of dental pathology and there were no pathologies observed on the rather limited number of bones present.

Grave 528

Grave 528 (KM1219) contains the remains of at least one adult. Surface preservation of the skeletal material is moderate. Overall, 30.8% (n=4) of the skeletal material cannot be assessed for pathologies. The individual is an adult female aged roughly 32-38 years at death. There is no evidence of dental pathology and there were no pathologies observed on the cranial bone.

Grave 529

Grave 529 (KM1292) contains at least one subadult. Surface preservation of skeletal material is very poor with the majority of it consolidated with dirt adhered to the surface of the bone. Overall, 66.0% (n=35) of the skeletal material could not be assessed for pathologies. The individual is a child aged six to nine years at death. There is no evidence of dental pathology and there were no pathologies observed on the bone.

Grave 532

Grave 532 (KM1391) contains at least two individuals, an adolescent and a skeletally mature adult. Surface preservation of the skeletal material is moderate to poor. Overall, only 3.5% (n=6) of the skeletal material cannot be assessed for pathologies. The adult individual is represented by only a duplicate left hamate and a fully fused proximal hand phalanx which is too large to be associated with the rest of proximal hand phalanges. The rest of the skeletal material belongs to the adolescent. The adolescent individual is aged 12-16 years at death. This individual displays calculus on a number of teeth and LEH on at least four teeth and possible evidence of a hematopoietic or infectious disease or a metabolic disorder.

Grave 533

Grave 533 (KM1541) contains very minimal postcranial bones of at least one subadult individual. Surface preservation of the skeletal material is moderate with some erosion and discolouration. Two bone groups are too fragmentary to assess for pathologies. Approximately 5.0% of a skeleton is present, including indeterminate cranial fragments, a right and left femur and an indeterminate long bone. There were no teeth observed. Roughly based on the size of the bones, the individual is older than a newborn but younger than one and a half years old at death. There were no pathologies observed on any of the bones. As there is no dentition, Lunt and Watt do not comment on the remains of Grave 533.

Grave 535

Grave 535 (KM2048) contains at least one individual. The surface preservation of the skeletal material is good to fair. Overall, 7.3% (n=14) of the skeletal material cannot be assessed for pathologies. The adolescent is aged 12 years+/-30 months at death. This individual displays supragingival calculus on ten teeth and mild osteophytic growth on the first cervical vertebra.

Grave 537

Grave 537 (KM1618) contains minimal remains of at least one subadult. Surface preservation of the skeletal material is moderate for the most part with some erosion, aside from the cranial fragments which are obscured by dirt. Three bones cannot be assessed for pathologies. Approximately 5.0% of a skeleton is present. The only remains observed are: fragments of the frontal and calvarium, a femur, a fibula and a tibia along with some rib fragments and an indeterminate bone fragment. There were no teeth observed. The estimated age, based on the size and development of the long bones, is around one and a half years of age at death. There were no pathologies observed on any of the material recovered. As there is no dentition Lunt and Watt do not comment on the skeletal material (1998: 113).

Grave 538

Grave 538 (KM1709) contains at least one subadult. Surface preservation of the skeletal material is predominately moderate. Overall, 29.8% (n=14) of the skeletal material cannot be assessed for pathologies. The child present is aged five to nine years at death. There is no evidence of dental pathology and there were no pathologies observed on any of the bones.

Grave 539

Grave 539 contains at least two adult individuals. Surface preservation of the skeletal material is moderate, for the most part, with some erosion and discolouration. However, the cranium, teeth and several long bones are treated with consolidant which has adhered dirt and/or fabric to their surfaces making assessment impossible. Overall, 24.3% (n=50) of all the skeletal material could not be assessed for pathologies. The South Skeleton is an adult probable male aged 18-34 years at death. The North Skeleton is an adult male aged 18-35 years at death. There was some mixing of the postcranial material which cannot be attributed conclusively to either individual. This consists of cervical and lumbar vertebrae, rib fragments and unidentifiable bone fragments. None of this material display any pathologies. In regards to prevalence of pathological occurrence, both individuals within the tomb display calculus and at least one LEH on their dentition. While only one of the two individuals displays periodontal disease and any postcranial pathology, in this case in the form of mild osteoarthritic changes to one shoulder and one foot. There was no trauma observed.

Grave 540

Grave 540 (KM1757) contains at least one infant. Surface preservation of the skeletal material is quite poor with eroded and discoloured surfaces. Overall, 39.3% (n=11) of the skeletal material cannot be assessed for pathologies. The infant is aged six months to a year old at death. There is no evidence of dental pathology and no pathologies were observed on the bones.

Grave 542

Grave 542 (KM1858) contains at least one subadult. Surface preservation of the skeletal material is predominately moderate. Overall, 17.1% (n=14) of the skeletal material cannot be assessed for pathologies. The child is aged eight years +/- two years at death. There is no evidence of dental disease and there were no pathologies observed on any of the bones.

Grave 543

Grave 543 (KM1859) contains at least one infant. Surface preservation of the skeletal material is good to fair. Only two teeth could be assessed for pathologies, while all but one of the bones could be. The bones indicate a perinate, while the dentition indicates an estimated age of birth +/- two months. There is no evidence of dental disease and there were no pathologies observed on the bones.

Grave 544

Grave 544 (KM3239) contains at least one infant. Surface preservation of the teeth is moderate. The estimated age of the infant is three to nine months at death. There is no bone recovered from within this grave. There is no evidence of dental pathology on the teeth present.

Grave 545

Grave 545 (KM2830) contains the remains of at least two adults. Surface preservation of the skeletal material is moderate to poor with erosion and discolouration on almost all the bones. Overall, 37.3% (n=28) of the skeletal remains cannot be assessed for pathologies. Skeleton A is adult aged 24-32 years at death. Skeleton B is an adult female aged 22-30 years at death. Both individual's display supragingival calculus, while only one display a carious lesion and ante-mortem tooth loss as well. There were no pathologies observed on the bones.

Grave 546

Grave 546 (KM1912) contains the remains of at least one adult individual. Surface preservation of the skeletal material is predominately moderate. Overall, 37.3% (n=19) of the skeletal material cannot be assessed for pathologies. The individual is a probable female aged 28-34 years at death. Several teeth are heavily worn into the pulp chamber which has resulted in one apical abscess and there were no pathologies observed on the bones.

Grave 547

Grave 547 (KM1922) contained only animal bone. There is record of a 'few phalanges and splintered shafts; humerus?' in the publication (1998: 95), however no human remains were located.

Grave 548

Grave 548 (KM1991) contains at least one subadult individual. Surface preservation of the skeletal material is fair to moderate. Overall, 24.7% (n=18) of the skeletal material cannot be assessed for pathologies. The child is aged three years +/-one year at death. There is no evidence of dental pathology and no pathologies were observed on the bones.

Grave 549

Grave 549 (KM 2011) contains at least one subadult. Surface preservation of the skeletal material is fairly good with only some of the material displaying any erosion to the bone surface. Overall, 21.6% (n=19) of the skeletal material cannot be assessed for pathologies. The individual is an infant aged two years +/- eight months at death. A small patch of porosity with an indeterminate aetiology was observed on a parietal fragment. No other pathologies were observed on the teeth or bones.

Grave 550

Grave 550 (KM2005) contains the remains of at least one adult. Surface preservation of the skeletal material is moderate to poor. Overall, almost half (47.1%, n=16) of the skeletal material cannot be assessed for pathologies. The individual is an adult female aged 32-42 years at death. This individual has an unusual odontome tooth. Supragingival calculus was observed on four teeth and one tooth displays a carious lesion. There were no pathologies observed on any of the bones.

Grave 551

Grave 551 (KM 2470) contains at least one infant. Surface preservation of the skeletal material is moderate to poor, though the dentition is in good condition. Overall, 39.3% (n=22) of the skeletal material cannot be assessed for pathologies. The infant is aged 18 months +/- six months at death. There is no evidence of dental pathology. There is mild porosity in the frontal orbits. No further pathologies were observed on the bones.

Grave 552

Grave 552 (KM2053) contains at least one subadult. Surface preservation of the skeletal material is predominately moderate. Two bones could not be assessed for pathologies due to poor preservation. The estimated age of the individual is a third trimester foetus to a perinate, however this is based roughly on bone size and development as there were no teeth recovered. There were no pathologies observed on the bones.

Grave 554

Grave 554 (KM2269) contains at least one infant. Surface preservation of the skeletal material is moderate to poor, however the dentition is in very good condition. Overall, 32.5% (n=13) of the skeletal material cannot be assessed for pathologies. The estimated age of the individual is birth to three months at death. There is no evidence of dental pathology and there were no specific pathologies observed on the bones.

Grave 555

Grave 555 (KM2384) contains at least one individual. Surface preservation of the skeletal material is fairly poor overall with severe erosion on many of the bones and consolidant obscured surfaces of the cranium. Overall, almost half (47.8%, n=22) of the skeletal material cannot be assessed for pathologies. The individual is an adolescent with an estimated age of 12 years +/-30 months. There is no evidence of dental pathology and there were no pathologies observed on the bones.

Grave 556

Grave 556 (KM2303) contains at least one infant. Surface preservation of the skeletal material is fairly moderate with some erosion and discolouration. Only two fragments could not be assessed for pathologies. The estimated age of the individuals is a third trimester foetus. There were no pathologies observed on the skeletal material.

Grave 557

Grave 557 (KM2455) contains the remains of at least one adult. Surface preservation of the skeletal material is very poor with all the bones still concreted in compact soil which was not removed. Overall, 39.2% (n=31) of all the skeletal material examined could not be assessed for pathologies due to this concretion. The individual represented is an adult probable female aged 22-34 years at death. There is no evidence of dental pathology and there were no pathologies observed on the bones.

Grave 559

Grave 559 (KM2315) is not recorded in the grave descriptions nor in the analysis of the dentition. The only record of this grave is in the index of buildings and graves, where this grave is recorded as a cancelled unit (Peltenburg *et al.* 1998: 261). The remains of at least one adult individual were observed. The surface preservation of the skeletal material is moderate with some erosion and discolouration. Overall, just over half (53.5%, n=23) of the skeleton could not be assessed for pathologies. The individual represented is an adult female with aged of 18-22 years. There is no evidence of dental pathology and no pathologies were observed on any of the bones.

Grave 560

Grave 560 (KM2400) contains the remains of at least one infant and possibly one adult. Surface preservation of the skeletal material is moderate to poor with some severe erosion and discolouration of the bones. Overall, 31.8% (n=14) of the skeletal material cannot be assessed for pathologies, all but one of which is bone. This means that 68.4% of the bones examined could not be assessed. The remains of an infant aged possibly nine months +/- three months constitute the majority of the skeletal elements within the grave. A single mandibular right first premolar indicates an adolescent or adult individual and is likely intrusive. There is no evidence of dental pathology and there were no pathologies observed on the bones.

Grave 561

Grave 561 (KM2338) contains the remains of at least one adult. Surface preservation of the skeletal material is good to moderate with erosion and discolouration on most of the material to variable degrees. Overall, 4.7% (n=8) of the skeletal material cannot be assessed for pathologies. The individual is an adult probable female aged 20-32 years at death. LEH, calculus and mild alveolar recession were observed on the dentition and both fifth metatarsals and a first proximal and first distal foot phalanx display mild osteoarthritic changes. There is no further evidence of pathology.

Grave 562

Grave 562 (KM2636) contains the remains of at least one adult. Surface preservation of the skeletal material is predominately moderate. Overall, 12.9% (n=8) of the skeletal material cannot be assessed for pathologies. The individual represented is a young adult female with a tentative age of 18-22 years at death. LEH was observed on several teeth but there is no evidence of dental disease and there were no pathologies observed on the bones.

Grave 563

Grave 563 contains the remains of at least three subadult individuals. Surface preservation of the skeletal material is predominately good to fair. Overall, 12.3% (n=27) of the skeletal material cannot be assessed for pathologies. The publication records a possible four individuals, however when the elements are examined by side and variations in dental development considered, it seems that there is only three. The bones are all mixed up and difficult to differentiate from each other as the individuals are not that far apart in age. Where possible, grouping of bones for each individual was attempted and aging was very roughly estimated by comparison with images in Baker *et al.* (2000). Based on the grave plans in the publication (1998: Fig. 57), it appears that there were two semi-articulated skeletons and that the other individual is represented only by dentition. Skeleton A is a child aged three to five years at death. Skeleton B is a child aged 18 months +/- six months. Skeleton C (KM2718.02) is supposedly represented by a single deciduous right maxillary central incisor (Lunt and

Watt 1998: 115), which could also be associated with Skeleton D. Skeleton D (KM2719.02) has an estimated age of two years +/- eight months. Within this grave there are only two cases of pathological expression observed. One individual displays a rough patch of new bone growth on the right humerus. This is not bilaterally recorded and does not suggest any specific aetiology. One individual displays a small patch of porotic hyperostosis on a parietal fragment, but again, there is no further evidence on the cranial material recovered to suggest a particular cause.

Grave 564

Grave 564 (KM2886) contains the remains of at least two infants. Surface preservation of the skeletal material is quite poor with obscured surfaces. Only a minimal amount of postcranial bone was recovered and no teeth. One infant is a possible perinate, based on the size of a single clavicle. The other infant is represented by a tibia and a femur and is aged around a year and half based on the size of the bone. These are tentative ages based on comparison of bone size and development with the standards of Sheuer and Black (2009) and Baker *et al.* (2000). There are several other bones, including a partial femur, ilium and several ribs, but given their fragmentary state it is not possible to estimate which individual they may be attributed to. None of the bones could be assessed for pathologies. As there are no teeth Lunt and Watt do not comment and the only mentions that there are two individuals in the grave synopsis (1998: 98).

Grave 565

Grave 565 (KM2887) contains the remains of at least one adult. Surface preservation of the skeletal material is very poor with most surfaces obscured. The individual is tentatively a male over the age of 25 years at death. There are no teeth and none of the bones could be assessed for pathologies.

Grave 566

Grave 566 (KM2693) contains the remains of at least one subadult. Surface preservation of the skeletal material is good to moderate with some mild erosion and discolouration on most of the material. Overall, 8.3% (n=7) of the skeletal material cannot be assessed for pathologies. The estimated age of the individual is six to ten years at death. The only pathology observed is porosity in the frontal orbits, with no specific aetiology assessed.

Grave 567

Grave 567 (KM2835) contains the remains of at least one individual. Surface preservation of the skeletal material is moderate with some erosion and discolouration. The teeth are in fairly good condition. Overall, 8.5% (n=10) of the skeletal material cannot be assessed for pathologies. The individual seems to be an adolescent aged ten to twelve years at death. LEH and calculus were observed on the dentition and the frontal bone displays cribra orbitalia in at least one orbit and the right radius appears bowed. No further pathologies were conclusively observed.

Grave 568

Grave 568 (KM2888) does not contain any human remains. There was a small amount of animal bone recovered.

Grave 569

Grave 569 (KM2948) contains the remains of at least one infant. Surface preservation of the skeletal remains is moderate however the teeth are in very poor condition. None of the teeth or cranial fragments could be assessed for pathologies. The estimated age of the infant is nine months +/-three months at death. There were no pathologies observed on the bones.

Grave 570

Grave 570 (KM2979) contains the remains of at least one infant. Surface preservation of the skeletal remains is moderate and the teeth are in fairly good condition. Overall, 9.1% (n=5) of the skeletal material cannot be assessed for pathologies. The estimated age of the infant is birth +/- two months at death. There is no evidence of dental disease and no pathologies were observed on the bones.

Grave 571

Grave 571 (KM3079) contains the remains of at least one adult. Surface preservation of the skeletal material is moderate with some erosion and discolouration. Overall, 12.0% (n=17) of the skeletal material cannot be assessed for pathologies. The individual is an adult female with a possible age at death of 22-48 years. Overall, this individual exhibits severe periodontal disease, attrition, calculus, ante-mortem tooth loss and apical cavities or bone infections of the maxilla and mandible and osteoarthritic changes to the cervical and thoracic vertebrae, three foot phalanges, one hand phalanx and the first left metacarpal.

Grave 572

Grave 572 (KM3465) contains the remains of at least one subadult. Surface preservation of the skeletal material is predominately moderate. Overall, 13.7% (n=7) of the skeletal material cannot be assessed for pathologies. The estimated age of the infant is two years +/- eight months at death. There is no evidence of dental pathology and there were no pathologies observed on the bones.

Grave 573

Grave 573 (KM3476) contains the remains of at least one subadult. Surface preservation of the skeletal material is good to moderate with only little to no taphonomic damage on many of the bones. Overall, 30.3% (n=23) of the skeletal material cannot be assessed for pathologies. The estimated age of the child is five years +/- 16 months at death. Two teeth display LEH. There were no pathologies observed on the bones.

Grave 574

Grave 574 (KM3478) contains the remains of at least one adult individual. Surface preservation of the skeletal material is predominately moderate. Overall, 33.9% (n=38) of the skeletal material cannot be assessed for pathologies. The individual present is an adult probable male aged 21-46 years at death. Calculus was observed on several teeth and there is a bone growth with unknown aetiology on the posterior surface of the occipital.

Grave 575

Grave 575 (KM3521) contains the remains of at least one infant. Surface preservation of the skeletal material is predominately moderate. The estimated age of the infant is two months +/- two months. There is no evidence of dental disease and there were no pathologies observed on the bones.

Miscellaneous Human Remains

There were 18 human bone samples recovered from non-funerary contexts which contain dentition and were examined by Lunt and Watt. Only one of these contexts could be located for this study and it was decided not to include this within the main body of human remains explored as it is not from a secure context. All the graves that Lunt and Watt discuss in the publication are included in this study. There are five graves within the grave catalogue which record minimal human bone but could not be located for this study.

Inter-observer Error

Overall, in regards to inter-observer error for age estimation, there was not a great discrepancy. Both Lunt and Watt's assessments and the conclusions arrived at for this study, are typically pretty close. There is usually a greater range in possible ages given in the current estimation, and this is may be due in part to Lunt and Watt's access to radiographs, particularly for subadult age estimates. Radiographs of the maxillae and mandibles recovered allows for a more precise estimation of age based on development of the enamel formation and root closures where the teeth are in position. Lunt and Watt also had the benefit of examining all the dentition together whereas for this study the teeth had to examined piecemeal as they were split between the museum in Paphos and the University of Edinburgh. In many cases half the dentition from one individual was taken to Edinburgh and the other half was left in Paphos. This made the assessment of things such as occlusion or eruption times difficult to compare as there were several months in-between the examination of half the dentition and the other half.

Appendix J: The codes and scales of assessment used within the data collection process for the palaeopathological examination

As noted in the main body of text, data was collected in *Statistics Package for Social Scientists (SPSS)*. The lists below form the structure of the data collection. Each bolded heading refers to a specific variable within the spreadsheet which was recorded for each skeletal element (or bone group) examined. The scales of fragmentation and preservation are unique to this study and incorporated to provide the ability to assess a qualitative aspect in a quantitative way.

Body Part: (BODYPART)
Head = 1
Teeth = 2
Spine = 3
Arm/Shoulder = 4
Hand/Wrist = 5
Thorax (Ribs & Sternum) = 6
Pelvis = 7
Leg = 8
Foot/Ankle = 9
Indet bone = 10

Bone Code: (BONECODE)
Cranium = 1
Cervical Vertebra = 2
Thoracic Vertebra = 3
Lumbar Vertebra = 4
Mandible = 5
Maxillary Dentition = 6
Mandible Dentition = 7
Scapula = 8
Clavicle = 9
Humerus = 10
Ulna = 11
Radius = 12
Carpal = 13
Metacarpal =14

Bone Code continued:
Hand Phalanx = 15
Sacrum = 16
Os Coxa = 17
Femur = 18
Patella = 19
Tibia = 20
Fibula = 21
Tarsal = 22
Metatarsal = 23
Foot Phalanx = 24
Hyoid = 25
Sternum = 26
Ribs = 27
Sesamoid = 28
Indet Vertebra = 29
Indet long bone = 30
Indet bone = 31
Auditory Ossicle = 32
Indet phalanx=33
Indet dentition=34

Side: (SIDE)
Left = 1
Right = 2
Axial = 3
Indeterminate = 0

Segment: (SEGMENT)
Frontal=1
Frontal orbit=2
Parietal=3
Temporal=4
Mastoid process (tem)=5
Petrous Portion (temp)=6
Occipital=7
Nuchal Crest (occ)=8
Basilar (occ)=9
Condyles (occ)=10
Sphenoid=11
Greater wings (sphe)=13
Maxilla=14
Alveolar (max)=15
Nasal=16
Zygomatic=17
Temporal proc (zyg)=18
Palate=19
Vomer=20
Lacrimal=21
Ethmoid=22
Nasal Cochlea=23
Internal Cranial=24
Calvarium=25
Facial =26

Mandible=27
Body (mand)=28
Mental trigon (mand)=29
Ascending ram (man)=30
Condyles (mand)=31
Coronoid proc (man)=32

MaxM3=33
MaxM2=34
MaxM1=35
MaxPM2=36
MaxPM1=37
MaxC=38
MaxI2=39
MaxI1=40
ManM3=41
ManM2=42
ManM1=43
ManPM2=44
ManPM1=45
ManC=46
ManI2=47
ManI1=48
dmaxM2=49
dmaxM1=50
dmaxC=51
dmaxI2=52
dmaxI1=53
dmanM2=54
dmanM1=55
dmanC=56
dmanI2=57
dmanI1=58
Indet max molar=59
Indet man molar=60

Hyoid=61

C1 vert = 62
Condyles C1 vert=63
C2 vert = 64
Dens C2 vert=65
Arc C2 vert=66
C3-C7 vert = 67
Body C vert=68
Art facets C vert=69

T1-T12 vert = 70
Body T vert=71
Art facets T vert=72
Transvers proc T vert=73
S.P. T vert=74

L1-L5 vert = 75
Body L vert=76
Art facets L vert=77
S.P. L vert=78
Transvers proc L vert=79
Indet vert=80

Sacrum = 81
Ala (sac)=82
Coccyx=83

Sternum manubrium = 84
Sternal body = 85
1st Rib = 86
2nd Rib = 87
Ribs 3-12 = 88
Head (rib 3-12)=89
Sternal end (rib 3-12)=90

Clavicle=91
Sternal ½ clavicle = 92
Acromial ½ clavicle = 93
Mid clavicle (no epi)=94

Scapula=95
Glenoid cavi (Scap) = 96
Acromion (Scap) = 97
Coracoid (Scap) = 98
Spine (Scap) = 99
Scapula (more than one frag) = 100

Humerus =101
Prox 1/2 humerus = 102
Mid humer -no epi =103
Dist 1/2 humerus = 104
Indet humerus = 105

Ulna=106
Prox 1/2 ulna = 107
Mid ulna (no epi) = 108
Dist 1/2 ulna = 109
Indet ulna = 110

Radius=111
Prox 1/2 radius = 112
Mid radius (no epi) = 113
Dist 1/2 radius = 114
Indet radius = 115

Scaphoid = 116
Lunate = 117
Triquetral = 118
Hamate = 119
Capitate = 120
Trapezoid = 121
Trapezium = 122
Pisiform = 123
Indet carpal = 124

MC1 = 125
MC2 = 126
MC3 = 127
MC4 = 128
MC5 = 129
Indet MC = 130

Hand 1st Prox Phal = 131
Hand Prox Phal = 132
Hand Interm Phal = 133
Hand 1st distal phal=134
Hand Distal Phal = 135
Indet Hand Phal = 136

Ilium = 137
Ant sup iliac spine=138
Iliac crest=139
Great Sciatic notch=140
Auricular surface=141
Ischium = 142
Ischial spine=143
Lesser sciatic notch=144
Pubis = 145
Pubic symphasis=146
Ischiopubic ramus=147
Acetabulum = 148
Os Coxa (# frags) = 149

Femur=150
Prox 1/2 Femur = 151
Mid Femur -no epi = 152
Dist 1/3 Femur = 153
Indet Femur = 154

Patella = 155
Medial ½ (pat)=156
Lateral ½ (pat)=157

Tibia=158
Prox 1/2 Tibia = 159

Mid Tibia –no epi = 160
Dist 1/2 Tibia = 161
Indet Tibia = 162
Fibula=163
Prox 1/2 Fibula = 164
Mid Fibula –no epi = 165
Dist 1/2 Fibula = 166
Indet Fibula = 167

Talus = 168
Sup art facet (tal)=169
Calcaneus =170
Sup art facet (calc)=171
Navicular = 172
Nav w no tubercle=173
Medial Cuneiform = 174
Interm Cuneiform = 175
Lateral Cuneiform = 176

Cuboid = 177
Indet tarsal = 178

MT1 = 179
MT2 = 180
MT3 = 181
MT4 = 182
MT5 = 183
Indet MT = 184

Foot Proximal Phal = 185
Foot Intermed Phal = 186
Foot Distal Phal = 187
Foot 1st Prox Phal = 188
Foot 1st Distal Phal=189
Indet Foot Phalanx = 190

Indet Long Bone = 191

Indet phalanx = 192
Indet epip/carp/tars= 193
Indet molariform = 194
Indet incisorform = 195
Indet canine = 196
Indet fragment = 197
Sesamoid bone = 198
Indet cranial = 199

Incus = 200
Malleus = 201
Stapes = 202
Indet tooth (roots)=203
Wormian bone = 204

Prox phal=205
Inter phal=206
Distal phal=207

Long Bone Segment Code (LBSEGCODE)
(Based on Buikstra and Ubelaker 1994)
Note: PE = proximal epiphysis vs. Pend = unfused proximal epiphysis
100 = not applicable
1 = PE
2 = PE-P1/3
3 = PE – M1/3
4 = PE – D1/3
5 = PE- DE
6 = P1/3 – M1/3
7 = P1/3 – D1/3
8 = P1/3 – DE
9 = P1/3
10 = M1/3
11 = M1/3 – D1/3
12 = M1/3 – DE
13 = D1/3
14 = D1/3- DE
15 = DE
16 = Pend - Dend
17 = Pend - DE
18 = Pend - D1/3
19 = Pend – M1/3
20 = Pend – P1/3
21 = Pend
22 = PE – Dend
23 = P1/3 – Dend
24 = M1/3 – Dend
25 = D1/3 – Dend
26 = Dend
27 = Indet Diaphysis

Number of Fragments: (number or weight in grams) (FRAGS)

Completeness (in regards to teeth inc. root): (COMPLETENESS)
(Based on Buikstra and Ubelaker 1994).
100% Present = 4
<75% Present = 3
25-75% Present = 2
>25% Present = 1

Fragmentation: **(FRAGMENTATION)**
Intact = 0
Broken (sizable pieces) = 1
Fragmentary = 2
Very Fragmentary = 3
No recognizable fragments = 4

Preservation: (PRESERVATION)
No surface defect = 0
Obscured surface - Concreted/Obscured by PVA & dirt surface = 1
Fair preservation - Chalky surface/Some taphonomic damage = 2
Moderate preservation - Chalky and some eroded areas/Some erosion and dirt discolouration = 3
Poor preservation - Chalky and eroded/Severe erosion and dirt discolouration = 4
Very poor preservation - Chalky with missing pieces (swiss cheese look) = 5

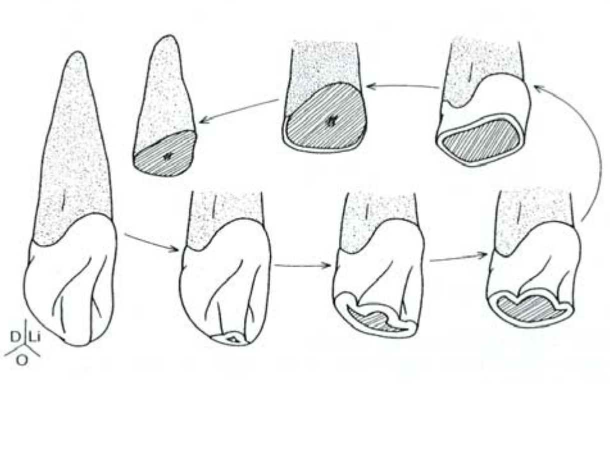
***NOTE:** Settlement bones have slightly different preservation appearance, therefore where in the cemetery the bone is chalky, in the settlement it is dirty/discoloured. The bones of the settlement sites are brown as opposed to the grey of the cemetery bone.

Tooth Context: (TOOTH CONTEXT)
1 = *In situ*
2 = Loose
100 = Not dentition

Tooth Wear Scale Code: (TOOTHWEAR)
This scale refers to the percentage of the crown present in regards to the levels of attrition and wear (based on Buikstra and Ubelaker 1994 for bones).
100 = Not dentition
3 = >75% present
2 = 25-75% present
1 = <25% present
0 = No Crown

Hillson Level of wear (HILLSON)
This scale refers to levels of wear outlined by Hillson (1996) for each specific tooth. These visual representations are useful for assessing the general normal levels and types of wear on a specific tooth. The scale for the maxillary canine is presented below as an example, however each tooth, based on tooth location within the dental arch has their own scale of wear. (Note: Level 1 refers to the complete tooth and increases counter-clockwise around the scale, with the final tooth root wear Level 7).

100 = Not dentition
0 = Cannot Be Assessed (CBA)



(Hillson 1996: 27).

Preservation of enamel: (ENAMEL)
100 = Not Dentition
0 = No Crown
1 = No surface damage – enamel glossy
2 = Mild enamel degradation
3 = Moderate enamel degradation - Pitted and chalky surface
4 = Severe enamel degradation - Severe pitting and chalky surface due to taphonomic processes
5 = Tooth surface obscured - Severe concretion
6 = Crown is eroded by other dental disease (i.e. calculus or abscess)
7 = No enamel, surface of crown gone due to post-mortem damage

Abnormality Present?: (ABNORMALITY)
Yes = 1
No = 0
Cannot be Assessed - CBA = 2
Possibly, unsure due to post-mortem damage to the area = 3

Type of Abnormality: **(ABTYPE)**
Not Applicable = 0
Pathology = 1
Activity Marker = 2
Non-metric variation = 3
Trauma (healed) = 4
Trauma (unhealed) = 5
Trauma (healing) = 6

Abnormality's Name (if known): (ABNAME)
(i.e. caries, osteophyte, LEH, etc…)

Calculus Present?: (CALCULUS)
0 = No
1 = Yes

Carie Present?: (CARIE)
0 = No
1 = Yes

LEH Present?: (LEH)
0 = No
1 = Yes

Osteoarthritic Change (i.e. osteophyte at articular surface or porosity or eburnation): (OSTEOARTH)
0 = No
1 = Yes

Disease or Disorder based change (i.e. cribra orbitalia or thickening of the skull) (ANEMIA)
0 = No

1 = Yes

Location of pathology on bone: (LOCATION)

Joint affected by pathology: (JOINT)
Not applicable = 0
Cranial-vertebral = 1
Vertebral = 2
Shoulder = 3
Elbow = 4
Wrist = 5
Finger = 6
Vertebral-sacral = 7
Hip = 8
Knee = 9
Ankle =10
Toe = 11

Description of abnormality: (DESCRIPTION)

Microscopic examination done: (MICROSCOPE)
Not applicable = 0
Yes = 1
No = 2
CBA = 3

Site Number: (SITE)
Souskiou-*Laona* Cemetery 1 = 1
Lemba-*Lakkous* = 2
Kissonerga-*Mosphilia* = 3

Bone Number (BONE)

Bone Letter (BONELETTER)

Tomb Number (TOMB)

Individual/Cranium/Bonestack I.D.: (CONTEXT)
(i.e. the letter given to reference the skeletal material)

Individual/Cranium/Bonestack Code: (CONTEXTCODE)
Individual = 1
Cranium = 2
Bonestack = 3
Commingled = 4
Unsure of Context = 5

Individual Age: (IND AGE)
This variable only relates to bones associated with an individual so that bones which have no age-able traits are aged based on the associated skeletal or dental material.

The age presented here is in code based on age category group based on Buikstra and Ubelaker 1994).

Senior Adult (50+) = 7
Adult (36-50) = 6
Young Adult (21-35) = 5
Adolescent (13-20) = 4
Child (4-12) = 3
Infant (neonate – 3 yr) = 2
Prenatal (foetus) = 1
Not Applicable = 0

Individual Sex: (IND SEX)
Male = 1
Female = 2
Subadult – unable to estimate sex = 3
Cannot be Assessed (CBA) = 4
Not Applicable = 0

Earliest Age: (EARLYAGE)
Unable to age = 200 (refers only to molars, os coxae and cranium)
Not Applicable = 300

Latest Age: (LATEAGE)
Unable to age = 200 (refers only to molars, os coxae and cranium)
Not Applicable = 300

Median Age: (MEDAGE)
Unable to age = 200 (refers only to molars, os coxae and cranium)
Not Applicable = 300

Age Category (based on median age): (AGECAT)
(From Buikstra & Ubelaker 1994)
Senior Adult (50+) = 7
Adult (36-50) = 6
Young Adult (21-35) = 5
Adolescent (13-20) = 4
Child (4-12) = 3
Infant (neonate – 3 yr) = 2
Prenatal (foetus) = 1
General adult (any adult age category) = 900 (Categories 1-4)
General subadult (any age of SA) = 500 (Categories late 4-7)
CBA = 700

Age Basis (AGEBASIS)
What element or reference the age estimation is based on.

Sex: (SEX)
Male = 1
Female = 2

Indeterminate = 0
Subadult = 3
Probable Male = 4
Probable Female = 5

Sex Basis (SEXBASIS)
What element or reference the sex estimation is based on.

Length: (LENGTH)

Stature: (STATURE)

Metrics: (METRICS)

MNI
Minimum Number of Individuals represented by the skeletal material within that row of data.

Photo's taken (PHOTOS)
Yes = 1
No = 2

Photo reference (PHOTOREF)
Numbers refer to the numbers given by the camera to the digital photographs taken

Further assessment required (FURTHER):
Not applicable/not necessary = 0
Radiograph = 1
CT Scan = 2
Radiograph & CT Scan = 3
Other test (specify in notes) = 4
Unsure = 5

Notes: (NOTES)

Appendix K: Synopsis of pathologies examined in other palaeopathological studies

*Note: EH = Enamel hypoplasias; CO = cribra orbitalia; PH = porotic hyperostosis; AMTL = ante-mortem tooth loss; OA = osteoarthritis/degenerative joint disease; DISH = diffuse idiopathic skeletal hyperostosis.

Author	Date	Location	EH	CO	Tooth wear	Trauma	Metabolic disorder	Caries	PH	AMTL	Harris Lines	Perio-dontal disease	Periostisis	Apical abscess	OA	Anaemia	Schmorl's Nodes	DISH	Calculus	Stature
Fox Leonard	1997	Cyprus	1	1		1	1	1		1	1	1	1	1	1	1	1	1		
Fox Leonard	1997	Greece	1	1				1		1		1	1	1	1	1	1	1		
Belcastro *et al.*	2007	Italy	1	1	1			1		1			1	1		1			1	
Belcastro *et al.*	2007	Italy	1	1	1			1		1			1	1		1			1	
Brickley and Ives	2006	England					1													
Facchini *et al.*	2004	Italy	1	1					1							1				
Facchini *et al.*	2004	Italy	1	1					1							1				
Nagar *et al.*	1999	Jerusalem													1		1			
Cucina and Iscan	1997	Florida	1																	
Pechenkina and Delgado	2006	Peru	1	1			1	1	1		1		1		1	1				1
Robb *et al.*	2001	Italy	1	1		1							1				1			1
Wentz *et al.*	2007	Florida	1	1		1			1			1	1		1					1
Obertova and Thuzo	2008	Slovenia	1	1																
Buzon	2006	Sudan	1	1					1				1			1				1
Blau	2001	UAE		1		1			1				1		1	1				
Eshed *et al.*	2005	Levant			1			1		1		1		1					1	
Papathanasiou *et al.*	2000	Greece	1	1		1		1	1	1			1		1	1				
Agelarakis *et al.*	1998	Israel	1		1			1				1							1	
Agelarakis	1997	Cyprus	1			1		1									1		1	1
Ruth	2000	Wisconsin	1	1		1	1	1	1			1	1	1	1	1				
Littleton	1998	Arabian Gulf	1	1			1		1		1		1			1				
Rose	2006	Egypt		1		1			1				1		1					

Author	Date	Location	EH	CO	Tooth wear	Trauma	Metabolic disorder	Caries	PH	AMTL	Harris Lines	Perio-dontal disease	Periostisis	Apical abscess	OA	Anaemia	Schmorl's Nodes	DISH	Calculus	Stature
Ubelaker and Pap	2009	Hungary	1	1		1		1	1	1			1	1	1					1
Gold	1999	Virginia	1	1	1	1	1	1	1	1		1	1		1					
Totals			19	18	5	10	6	12	12	8	3	7	15	7	11	12	5	2	5	6

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