

**Co-designing of an intervention to support health visitors'
implementation of practices recommended for prevention of excess
weight gain in 0-2 year old children.**

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Abstract

Background: Early rapid weight gain is a risk factor for later obesity. UK health visitors (HVs) are well-positioned to address excessive weight-gain trends in early childhood. However, HVs face unique barriers when caring for children under age two with excessive rates of weight gain. Interventions that strengthen HVs' role by addressing key barriers and facilitators of implementation of recommended guidelines into routine practice are needed.

Aim: This research engaged with HVs to systematically design an intervention to support their implementation of practice behaviours.

Methods: A mixed-methods evidence synthesis and series of interactive workshops with HVs were conducted. HVs who are the recipients of the intervention provided their views of what is important, relevant, and feasible in the local context. The findings of the workshops were combined in an iterative process to inform the sequential steps of the Behaviour Change Wheel framework and guide the process of designing the intervention.

Results: Theoretical analysis of the workshops revealed HVs' capabilities, opportunities, and motivations related to addressing early-childhood obesity prevention. Intervention strategies deemed most likely to support implementation (enablement, education, training, modelling, persuasion) were combined to design a face-to-face interactive training intervention. Outcome measures to test feasibility, acceptability, and fidelity of delivery of the proposed intervention were identified.

Discussion: An interactive training intervention has been designed, informed by behaviour change theory, evidence, expert knowledge, and experiences of health visitors, in an area of health promotion that is currently evolving. Future research should be directed to evaluate the acceptability and feasibility of the intervention in a pilot trial. The use of a systematic approach to the development process, identification of intervention contents and their hypothesised mechanisms of action using standard terminology provides an opportunity for this research to contribute to the body of literature on designing of implementation interventions using a collaborative approach.

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List of acronyms and abbreviations

APEASE: Affordability, Practicality, Effectiveness and cost effectiveness, Acceptability, Side effects/safety and Equity

BCT: Behaviour Change Technique

BCW: Behaviour Change Wheel

BMI: Body Mass Index

COM-B: Capability, Opportunity, Motivation - Behaviour

CPD: Continuing Professional Development

DCC: Durham County Council

DHSC: Department of Health and Social Care

FoD: Form of delivery

HCP: Healthy Child Programme

HDFT: Harrogate and District NHS Foundation Trust

HSE: Health Survey England

HV: Health Visitor

iHV: Institute of Health Visiting

MoA: Mechanism of Action

SR: Mixed methods Systematic Review

MRC: Medical Research Council

NCMP: National Child Measurement Programme

NHS: National Health Service

NICE: National Institute of Health and Care Excellence

NIHR: National Institute for Health Research

PA: Physical activity

PCP: Primary care practitioner

PHE: Public Health England

SE: Stakeholder engagement

WHO: World Health Organization

UK: United Kingdom

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Chapter 1. Introduction.

1.1 Overview

This introductory chapter provides the background to and rationale for this thesis, which describes the systematic development of an intervention for health visitors (HVs) to strengthen their role in prevention of overweight in 0-2 year old children. It begins with a brief review of the published literature on the definition, prevalence, and developmental origins of childhood obesity (sections 1.2, 1.3, and 1.4), and risk factors and consequences of excess weight gain during the first two years of life (sections 1.5 and 1.6). The next section (1.7) presents an overview of the current literature on topics related to prevention of obesity during early years. The rationale for the importance of early prevention is highlighted (subsection 1.7.1) and the emerging evidence on healthcare practitioner-led interventions to prevent or reduce obesity in children aged 0-2 years is discussed (1.7.2). Next, the government's population-wide policies and initiatives to support childhood obesity prevention during early years (the first 1000 days) are briefly described (subsection 1.7.3). Prevention of early childhood (birth to 5 years) obesity on a population level is placed within the context of integrated primary and community care services (1.7.4), the HV-led Healthy Child Programme 0-5 (HCP 0-5) in England (1.7.5), and current guidelines that provide recommendations to support HV's role in promoting child healthy weight (1.7.6). This is followed by an overview of the principles of health visiting along with a brief discussion on HV's public health nurse role (1.8). The next section highlights the need to support primary care practitioners' (PCPs) implementation of recommended practices (1.9) and presents a summary of the evidence on interventions that show potential in improving implementation of guidelines. Subsequently, the research site and the rationale for my research are stated (1.10). Finally, the research aims, and key objectives are set out, along with a summary of the content of the thesis chapters (1.11).

1.2 Overweight and obesity in infancy: definition and classification

For the purposes of this thesis, the term "infant" is applied to include children aged 0 to 24 months, as used in the literature on obesity in infancy and early childhood (1, 2). The definition of overweight (any weight in excess of a pre-determined standard) and obesity (presence of excessive body fat) in infants is a contentious topic because of wide variation in

growth patterns during infancy. Weight gain during early life in healthy infants is a result of rapid increase in the infant's linear growth along with increase in both fat-free mass and fat mass. The rate of linear growth is important because, in babies with faster weight gain, those with accompanying faster linear growth have less fat mass than those without (3). Additionally, patterns of growth and body fat composition vary, depending on how infants are fed. In the first six months, breastfed infants have faster weight gain and higher fat mass than bottle-fed infants; but by one year of age, this pattern reverses (4).

Body mass index (BMI), calculated as weight (in kilograms)/height (in metres)², is considered by the National Institute for Health and Care Excellence (NICE) as a useful practical measure for adiposity and screening tool for clinical purposes and population surveillance of overweight and obesity in children > 2 years old and adults (5). For children aged 2-18 years, the BMI calculation considers age and gender as well as height and weight. A child's BMI is expressed as a 'percentile' to show how their BMI compares with other children(6). This means that a boy with a BMI in the 80th percentile has a BMI higher than the BMI of 80% of boys his age in the reference population. BMI values in children should be cautiously interpreted because BMI only measures total mass and cannot distinguish between lean mass (bone and muscle) and fat mass (7). Although recent studies have suggested that BMI may be a reliable weight measure *and* predictor for future obesity risk in infants (8, 9), experts recommend weight-for-length as the anthropometric standard to assess growth in children < 2 years and BMI after age 2 years (10). The normality of the pattern of growth of children is determined by comparison to a growth chart. In 2006, the World Health Organization (WHO) published growth standards for children aged 0–5 years based on data compiled from six countries (representing different ethnic groups) of growth patterns of infants who were born at term to non-smoking, relatively affluent mothers after a healthy pregnancy and breastfed exclusively (or predominantly) for the first six months of life, to indicate optimal growth rates in healthy, breast-fed infants (11).

Since 2009, growth for children aged 2 weeks to 4 years of age in England (and in the devolved nations within the UK) is monitored by using age- and gender-specific height (length for children < 2 year) and weight growth charts which have been designed by combining WHO standard data with British 1990 (UK90) birth data (12). These WHO-UK growth charts which replaced the previous UK90 charts include a tool that enables reading

of the BMI centile (without need for calculation), following measurement of height and weight of the child. In children >2 years of age, the BMI centile is considered to be a better indicator of overweight or underweight than the weight centile. A wide range of BMI thresholds are used for defining childhood obesity, but in the UK, two sets of thresholds have been proposed (13). The epidemiological thresholds (monitoring the health of the whole child population) classify children with BMI centile of > 85 as 'at risk of overweight' and of >95 as 'at risk of obesity'. The clinical thresholds (assessing health of individual children) classify children with BMI centile of > 91 as 'overweight', and of >98 as 'obese'. The use of the UK-WHO growth charts is likely to have an impact on how growth patterns of 0-4 year old children in England are interpreted and whether a specific growth pattern should give cause for concern (14). The centiles for both weight and BMI from the first year onwards on the UK- WHO charts are nearly one centile space lower than for the previously used UK90 growth reference (15). A study of serial growth patterns of infants and toddlers in England (16) has shown that children match the charts well for length and height at all ages and for weight in the early weeks but after the age of six months, around twice as many children between one and four years will be above the 98th centile for weight compared with the older UK90 charts, and only one in 200 children will be below the second centile.

1.3 Prevalence of childhood obesity

Notwithstanding differences in measures and definitions, the prevalence of excess weight (overweight and obesity) among 0-5-year-old children has risen rapidly over the past two decades in both developed and developing countries (17). Many countries now face the simultaneous burdens of obesity and high rates of undernutrition and stunting in children. There are now more children with excess weight in low- and middle-income countries than in high-income countries. The WHO has estimated that, if the increasing trends continue, the global prevalence of overweight in pre-school age children will rise to 11% by 2025, up from 7 % in 2012 (18). However, in countries such as the USA, UK and Australia, prevalence rates of excess weight in 5 year old children are already as high as 22 to 27% (19, 20).

Data on prevalence of excess weight in children aged 0-2 years is very limited. Currently, national-level data on estimates of prevalence of excess weight in infants are published only in the USA (21). The National Health and Nutrition Examination Survey in USA uses the WHO sex-specific weight-for-recumbent length growth standards (22) to monitor growth in

children <2 years and applies the 97.7th percentile as the cut-off point for defining excess weight. Based on this criteria, prevalence data published in 2018 show that in 2017-2018, an estimated 9.6% of children aged 0-24 months had excess weight (21).

Like other high-income countries such as Australia and USA, children from socioeconomically disadvantaged families in the UK have higher rates of obesity than children experiencing less disadvantage (23). The main source of data for childhood obesity in England is the National Child Measurement Programme (NCMP) which includes nearly all children in school reception year (aged 4-5) and year six (aged 10-11). NCMP data for the 2019/20 school year estimated that in England, almost 1 in 4 children (23%) in reception year had excess weight (including 9.9% with obesity), with the prevalence of obesity more than double in the most deprived areas (13.3 %) compared to the least deprived areas (6.0 %) (24). The Health Survey for England (HSE) publishes data on childhood obesity covering children aged 2-15 years; however, this data is less precise, because, as a sample, HSE has much lower coverage than NCMP. Most recent HSE data (combined for 2018 and 2019) estimated that among 2-4 year olds, 20% boys (including 8% with obesity) and 23% girls (including 8% with obesity) are with excess weight (25). The NCMP data also show that ethnicity has an independent effect on obesity prevalence; obesity prevalence was estimated to be highest for Black children in both reception and year 6, and lowest for Chinese children in Reception and White and Chinese children in year 6. The reasons for these associations are complex and multifactorial.

Evidence suggests that unhealthy infant diet and feeding practices are the prime mechanisms for the association between socioeconomic disadvantage and risk of childhood obesity (26). Analyses of trends in BMI from 2006/07 to 2019 using NCMP data show that inequalities in excess weight (overweight and obesity) prevalence in reception (aged 4 to 5 years) and year six (aged 10-11 years) children across different levels of deprivation (measured by index of multiple deprivation quintile) are widening (27). This is attributed to downward trends in excess weight in children who live in the least deprived areas and upward trends in children (with the exception of boys aged 4 to 5 years) who live in areas that are most deprived. These findings indicate that children from socioeconomically disadvantaged families are in greater need for support to establish healthy lifestyle behaviours early in life.

1.4 Developmental origins of childhood obesity

The period from conception until 2 years of age – referred to as the first 1000 days - is characterised by rapid physical and physiological development and also behavioural and metabolic plasticity. Evidence suggests that an unfavourable environment during pre-natal and early postnatal life has a sustained and intergenerational effect on health and risk of chronic diseases for the child (28). During this critical phase of life, sustained exposure to specific nutritional environments may trigger epigenetic modifications (persistent and heritable changes to the DNA such as DNA methylation), gene expression and phenotypes, influence developmental trajectories, and susceptibility to long term disease across the life course. For example, intrauterine exposure to over-nutrition, such as in mothers with obesity and/or gestational diabetes, could introduce potentially irreversible long-term changes in foetal organ systems, leading to obesity and metabolic syndrome in adult life (29). In postnatal life, the protective effects of sustained breastfeeding on weight and cardiometabolic health are believed to be mediated through epigenetic modifications and bioactive components present in breastmilk (30).

A growing body of evidence from experimental and epidemiological research over the past two decades has enabled better understanding of inter-related pathways that explain the relationship between nutrition in early life and risk of obesity during childhood and adult life (31, 32). How and what infants are fed can influence weight gain during infancy and across the life course through several interacting pathways. The nutritive and non-nutritive components of the infant diet (e.g., breast milk, formula milk, type of solid foods) and the behavioural and social context of infant feeding practices are believed to interact with various physiological and neurohormonal factors and the intestinal microflora to shape differing patterns of growth and body composition, energy metabolism, appetite regulation and food preferences that emerge during infancy and track across the life course (32, 33).

1.5 Early life risk factors for childhood obesity

Several systematic reviews (34, 35) and scientific reports (36) have summarised the evidence from predominantly observational studies about key inter-related and modifiable early life (up to 3 years of age) risk factors for childhood obesity. The precise mechanisms through

which these inter-related factors increase the risk of obesity are not entirely clear. These factors are described in more detail in the subsequent sections.

1.5.1 Early life growth trajectories

High birth weight

There is strong evidence that high birthweight (defined as more than 4 kg at birth) is associated with risk of overweight and obesity in later childhood and also in adult life (35, 37). In 2019, around 10.5% of single live births in England weighed ≥ 4 kg (38). The positive association between high birth weight and obesity risk appears to be stronger for girls than for boys (37, 39). Over the past 30 years, there has been an increase in the average birth weight of live, singleton births in developed countries, including in the UK. This increase has been attributed to various factors including decrease in deprivation levels, increase in maternal age and non-white ethnicity, increase in maternal obesity, and reduction in maternal smoking (40).

Rapid infant weight gain

Rapid weight gain during infancy (in term babies with normal or low birthweight) is recognised as a strong predictor of overweight and obesity during childhood and later in the life course (2, 41, 42). There is no international standard for defining rapid weight gain in infants. Most studies measure weight gain velocity using the WHO 0-24-month growth chart which shows a 2/3rds (0.67) BMI z-score¹ (6) line spacing. Weight gain z-score of >0.67 to 1.28 between any two points of time is defined as rapid weight gain (extremely rapid if it is >1.28); this represents crossing upwards of one or more of the weight percentile lines on the chart (43). A systematic review which examined the association between rapid weight gain during infancy and risk of subsequent adiposity found that the percentage of infants showing rapid weight gain (based on the above definition) ranged from 12.3% to 54.2% across the twelve studies that reported this finding; most, but not all of these studies originated from developed countries (2). Centile crossing during infancy is common and can be complex in presentation. A UK cohort study found that, from birth up to 5 months of age, centile crossing in two successive months was in the same direction (positive feedback) but over the

1 The BMI Z-score (or standard deviation (SD) score) quantifies the distance and direction of the BMI from the mean value of the reference (age and sex matched) population. For e.g., if a z-score is equal to 0, it represents the mean value at that sex and age; if a score is equal to +1, it is 1 SD *above* and if it is -1, it is 1 SD *below* the mean value at that sex and age.

subsequent 5-6 months, centile crossing was in the opposite direction (negative feedback) (44). Therefore, when predicting future weight gain from current weight, it is recommended that the significance of recent centile crossing should be interpreted in the context of any previous centile crossing and the child's age.

Early adiposity rebound

Normally, the BMI, after a rise in infancy and subsequent decline, starts to gradually rise again (adiposity rebound) between 5 and 7 years of age. Evidence suggests that an earlier adiposity rebound (AR) (between 3 and 3.5 years age) is associated with increased adiposity and obesity risk in children and adults (45). An early AR has been associated with parental obesity but not with the child's socioeconomic environment or dietary factors. Children who show an early AR typically have an initially low BMI and low fat mass (suggesting energy deficit during prenatal life) followed by a steep rise in BMI and high fat mass after the rebound (suggesting rapid post-natal growth). There is evidence that children with this pattern of BMI are at increased risk of diabetes and coronary artery disease in adult life (46, 47). These findings emphasise the importance of regular monitoring of BMI during early childhood and targeting modifiable risk factors in very early life to delay the timing of AR.

1.5.2 Parental weight status

There is strong evidence of a graded association between parental overweight status and childhood obesity; children with two parents affected with obesity are 10 to 12 times more likely to be affected with obesity (36, 48). This association is stronger with maternal overweight status, which may reflect the influence of prenatal and early postnatal environmental factors on infant growth and development (49). Research suggests that parental obesity can interact with an infant's appetitive behaviours (such as enjoyment of food and satiety responsiveness) to increase their risk for childhood obesity (50). These findings suggest that assessing familial risk factors in addition to child's eating behaviours is important in considering the risk of obesity for the child and planning appropriate prevention intervention strategies.

1.5.3 Parental smoking

Both paternal smoking (any time) and maternal smoking (during pregnancy) have been linked with increased risk of obesity in the offspring (51). The evidence for a direct association between risk of excess weight gain in 2-year-olds and maternal smoking during

pregnancy is particularly strong even after adjusting for mother's socioeconomic position and education level (52). The precise mechanism underlying this association is unclear. Compared to infants of non-smoking mothers, infants born to mothers who smoke are more likely to weigh less at birth (possibly due to the vasoconstrictive effect of nicotine on placental circulation and foetal hypoxia), have relatively more body fat than lean body mass, and show more rapid postnatal weight gain. These findings have important clinical implications because infants who are born small and subsequently show rapid weight gain are at high risk of developing cardiometabolic disease during adult life (53). Most recent estimates suggest that 1 in 10 women in England smoke during pregnancy, with significant inequalities across the nation (54). Hence, reduction of smoking during pregnancy and reducing inequalities in smoking rates is a priority public health issue.

1.5.4 Maternal weight gain during pregnancy

Both maternal pre-pregnancy excess weight and increased gestational weight gain are associated with risk of high infant birth weight (> 4kg) and overweight and obesity in childhood; the presence of gestational diabetes further increases this risk (34, 35). Maternal overweight and obesity are important mediators for gestational diabetes which is well documented as a risk factor for high birth weight and childhood obesity (49). Increased placenta size leading to increased exposure to glucose and nutrients passing to the fetus and resulting in larger fetus size and programming of the fetus to be more prone to obesity are possible mechanisms. There is some evidence that there may be a maternal genetic link underlying the association between high maternal BMI and hyperglycaemia, and high offspring birthweight. A study that analysed offspring birthweight data of 30,487 single live births from mothers of European ancestry found that genetically elevated maternal BMI and high blood glucose levels were significantly associated with higher offspring birthweight (55).

Data from England show that, in 2019, at their first antenatal booking appointment, almost 50% of women were assessed as having excess weight (BMI \geq 25 kg/m²) and of these, 22% were assessed as having obesity (BMI over 30kg/m²) (56). This data also shows that obesity during and before/after pregnancy is associated with inequalities, with higher prevalence reported in women living in deprived communities and from Black ethnic groups. The importance of supporting all women to achieve and maintain a healthy weight is emphasised in guidance published for practitioners (57). There is evidence that behavioural interventions

during pregnancy targeted at mothers with obesity have the potential to improve maternal diet and some reduction of offspring adiposity; however, the evidence for a beneficial effect on risk of childhood obesity is limited (58).

1.5.5 Infant diet

Infant milk feeding

Infant feeding is an important determinant of weight gain trajectories. Regular formula feeding, irrespective of sociodemographic characteristics or extent of associated breastfeeding, increases the risk of rapid weight gain during infancy (59, 60). Higher protein content in infant formula and increased consumption of milk due to non-responsive feeding practices (e.g., feeding on schedule and feeding until bottle is empty) have been suggested as possible mechanisms for accelerated growth in formula-fed infants. In contrast, exclusive breastfeeding for at least six months is protective against obesity during later childhood (59). The beneficial effects of breastfeeding on weight have been linked to lesser energy and protein content of breast milk, bioactive components that promote growth of protective intestinal bacteria, improving self-regulation of appetite (mediated by breast-milk leptin), and facilitating the development of preferences of foods that promote healthy weight gain (32, 61).

UK policy recommends exclusive breastfeeding for the first six months of life (62); even so, the UK has some of the lowest breastfeeding rates in the world. An analysis of global breastfeeding prevalence published in 2016 found that only one-third of UK infants were receiving some breast milk at six months, compared with 49% in the USA and 71% in Norway (63). Breastfeeding initiation rates have improved in UK and in England over the past decade, but they tend to decrease rapidly over the first weeks after birth. Figures for England for 2017/18 (64) showed that although 74% of new-borns received either maternal or donor breast milk as their first feed, only around 43% of infants were being totally or partially breastfed at 6-8 weeks post-partum. Breastfeeding is an emotive topic in the UK because many families have not breastfed or have had negative breastfeeding experiences. A proportion of mothers and healthcare practitioners view breastfeeding as being difficult to achieve, whilst formula feeding is seen as a convenient alternative (65). A UK-wide survey of infant nutrition conducted in 2011 (66) estimated that infant formula was the largest contributor to energy intake for infants aged 4 to 11 months for all socioeconomic categories

and around one third of infants aged 4 to 6 months were on 'follow-on formula' (which is higher in protein content and not recommended before six months). Various inter-related personal, familial, cultural, and social factors may influence an expectant mother's process of weighing-up reasons for and against breastfeeding (67). In England, breastfeeding initiation and duration rates are lowest in mothers who are White British, living in socioeconomic disadvantaged communities, of younger age and with no academic qualifications at first motherhood, multiparous mothers, and those with obesity (68).

Complementary feeding

Gradual introduction of a wide range of foods (complementary feeding) is recommended from the age of six months (57). However, complementary feeding before six months is common practice in the UK; a national survey found that as many as 75% of infants younger than five months were introduced to complementary foods (69). This is of concern because evidence from observational studies (70, 71) strongly suggest that early introduction (before 4 months of age) of complementary foods, particularly in formula-fed infants is associated with risk of childhood obesity, compared with later introduction, at 4-6 months. Certain infant characteristics (faster growth and fussy temperament), feeding styles (formula-fed, either exclusively or in combination with breast milk) and maternal characteristics (maternal overweight and poor diet quality) have been shown to be associated with early introduction of complementary feeding (72). Availability of large number of baby foods and drink products in the UK market that are labelled as suitable for infants aged four months has been suggested as a contributory factor (62).

In addition to the timing of introduction of complementary foods, the type of foods offered to the child is also important. During infancy, individual patterns of food preferences emerge through a process of familiarisation and learning (73). Offering home-cooked foods of varied taste, textures and flavours (rather than ready-made preparations) is recommended to promote greater acceptance and intake of vegetables and fruits during later childhood (62). Studies have shown that being exposed to a variety of vegetables during introduction of complementary feeding increases acceptance and intake of vegetables in infants (74). However, UK surveys conducted over the past decade have consistently reported that infants are routinely offered energy-dense and nutritionally poor foods (66, 69, 75). High consumption of foods rich in dairy protein (>15% of total daily energy intake) and energy

dense foods (such as snacks or drinks high in sugar content between meals) in children aged 12-24 months is associated with risk of childhood obesity (76). Multiple factors may influence a parent's feeding practices including demographic characteristics (low income, young single parent, lower educational attainment), lack of understanding about healthy infant feeding practices, perceiving infant distress and poor sleep as hunger cues, and cost and time constraints (77, 78).

1.5.6 Parental feeding styles

Parental feeding styles, infant's temperament and self-regulation abilities, and parent-child feeding interactions during the first 2 of years of life are important influences on childhood weight gain (79). Responsive feeding styles promote the infant's ability to self-regulate energy intake and are characterised by parents' understanding of and sensitivity to the infant's hunger and satiety cues (80). Responsive feeding is associated with practices that promote healthy weight gain (longer breastfeeding duration and later introduction of solid foods). In contrast, non-responsive feeding styles are characterised by lack of understanding of children's needs and cues, leading to either excessive caregiver-control (such as restrictive or pressurised feeding practices) or excessive child control (indulgent feeding). Evidence from cross-sectional studies suggest that non-responsive feeding practices (e.g., frequent formula feeding, adding cereals in bottle, putting an infant to bed with bottle) increase the risk of rapid infant weight gain and childhood obesity (60). Mothers of children with high negative temperament (easily distressed, inhibited, cry often and difficult to soothe) are more likely to report lower awareness of infant's satiety cues and engage in non-responsive feeding practices (e.g., using food to calm, offering sweet foods and drinks, offering caloric drinks at night), thus increasing the risk of obesity in these children (81). Feeding to soothe may lead to the child learning to eat in response to their emotions (food is seen as a reward and source of comfort) rather than internal hunger and satiety cues (82). Children with lowered ability to self-regulate food intake are at risk of later childhood obesity because they may find it difficult to avoid energy-dense, palatable foods that may be available in their environment, as they grow up.

As complementary feeds are introduced, children develop individual feeding patterns through self-regulation of appetite. Serving large meal sizes to children aged 18-24 months old can disrupt the self-regulatory mechanisms and increase the risk of obesity (83). This

finding is significant because the majority of parents in the UK routinely offer children aged 6 months to 3 years larger than recommended portions of energy-dense foods and snacks and sweetened drinks (75). An alternative approach to traditional parent-led feeding in which infants feed themselves has been proposed as a method for introducing complementary feeding; this approach is based upon evidence from observational studies which suggests that a baby-led approach improves the infant's responsiveness to satiety cues, reduces food fussiness and promotes healthy weight (84). However, a later randomised control trial did not support these findings (85). Currently, there is insufficient evidence to recommend baby-led feeding as the better alternative.

1.5.7 Physical activity and sedentary behaviours

Levels of physical activity (PA) are typically established during early childhood and may track into adolescence (86). UK guidelines recommend that PA should be encouraged from birth (e.g., play activities) and children aged 1 to 4 years should be physically active every day for at least three hours/day. However, PA levels in 2-4-year-olds in England typically do not meet the recommendations (87). Low levels of PA in pre-school children have shown strong association with risk of overweight in later childhood (88). The frequency and intensity of PA required to prevent childhood overweight is unclear but there is substantial evidence that PA combined with diet interventions can reduce the risk of obesity during the pre-school period (89).

In the increasingly digital world, exposure to electronic screens has emerged as the predominant sedentary behaviour in children of all ages. A study of screen time in a diverse UK sample found that average TV viewing time in 30-month-old children was >2 hours/day (90). Like PA, screen viewing behaviours develop during infancy and persist into later childhood. There is no detailed guidance for screen time for pre-school children in the UK. The WHO recommends that children <2 years should not be exposed to any TV/electronic screens and to limit exposure to maximum of 1-2 hours a day for children aged 2-5 years (91). Studies (90, 92) have reported the association of certain maternal characteristics (maternal overweight, single mothers, lower maternal age, low family income, not breastfeeding, belonging to an ethnic minority, and experiencing depression) and infant characteristics (perceived fussiness or hyperactivity) with higher TV exposure. There is evidence that excessive TV/screen viewing in children aged 1 to 4 years is associated with high BMI (93); the mechanism for this association are hypothesised to be decreased energy

expenditure (displacement of PA) and increased energy intake (internal satiety cues suppressed by distraction from TV leading to frequent snacking). Parent-led interventions delivered by trained health practitioners have the potential to reduce screen time during infancy and establish healthy lifestyle behaviours during later childhood (94).

1.5.8 Sleep duration.

WHO guidelines recommend that infants aged 3 to 12 months should have 12 to 16 hours of good-quality sleep/24 hours, and children aged 1 to 2 years should sleep daily for a total of 11 to 14 hours (91). Reduced and poor sleep in pre-school children may increase the risk of later childhood obesity (95). The mechanisms underlying this association are unclear but may be related to increased energy consumption due to more awake time and impairment of appetite and satiety cues due to hormonal changes triggered by lack of sleep. Promotion of sleep through implementation of sleep routines and removal of TV screens from children's bedrooms may help to prevent obesity in young children (96).

1.5.9 Parental perceptions of child weight.

There is substantial evidence that parents across different ethnic populations frequently underestimate their 0-2 year old child's weight (97, 98). Underestimation of an infant's weight is more likely to occur in overweight mothers with overweight infants. Parents tend to have negative perceptions of infant growth at the lower percentiles and show preference for their child's growth to show progression towards the higher percentiles (99). This is a matter for concern because parents who underestimate their child's weight are more likely to engage with unhealthy infant feeding practices, to lack understanding of strategies to prevent rapid infant weight gain, and to be less likely to follow official recommendations (100, 101). On the other hand, parents who perceive that their child's weight is a health-related problem are more likely to implement healthy weight promoting interventions (102). These findings highlight the role of health practitioners in improving parents' assessment of their child's weight.

1.5.10 Socioeconomic patterning of early life risk factors

In high-income countries, like the UK, there is a strong inverse association between socioeconomic position (SEP) and prevalence of childhood obesity. However, this inverse association is not observed at birth; indeed, UK mothers from high SEP are likely to give birth

to heavier babies as compared to mothers from low SEP (103). A study of a large sample of UK infants found little socioeconomic patterning in the trajectories of BMI during the first two years of life, with inequalities emerging between 3 and 4 years of age (104). There is a strong socioeconomic gradient for majority of the early life risk factors for childhood obesity (105, 106); they include pre-natal factors (maternal overweight, maternal diabetes), ante-natal factors (exposure to smoking), and early-life nutrition (lower breastfeeding initiation and duration, early introduction of solids, poor maternal and infant diet quality), and TV viewing. These findings indicate that efforts to reduce inequalities in childhood obesity should target socioeconomically disadvantaged mothers with healthy lifestyle interventions during pregnancy and the child's early years.

1.6 Consequences of excess weight gain during early years

There is strong evidence that obesity tracks from infancy into early childhood, and from childhood into adulthood (42, 107). A longitudinal study found that BMI trajectories in children who were having severe obesity by age 6 years began to deviate from those in children who remained at normal weight as early as age 4-6 months (108). Another study (109) that conducted prospective and retrospective analysis of the course of BMI in 51,500 children from birth to adolescence found that 90% of children who were with obesity at 3 years of age were having overweight or obesity in adolescence. This study also found that around half (53%) of the adolescents living with obesity had been overweight or obese from 5 years of age onward; further, among the adolescents with obesity, the most rapid increase in annual BMI had occurred between 2 and 6 years of age.

Obesity in childhood is associated with several conditions that can significantly affect quality of life, including asthma, musculoskeletal problems, early onset of diabetes, hypertension, hyperlipidaemia, coronary artery disease, fatty liver disease, and certain types of cancer (110). Of particular concern is the finding that children as young as age 3 years with severe obesity may show elevated levels of inflammatory biomarkers that are associated with adult cardiovascular disease (111). There is some evidence that 6-24 months old infants with obesity may show lower cognitive development and delayed gross and fine motor development compared to normal weight peers (112). Children with obesity are also likely to experience discrimination and bullying (which in turn can result in body image issues and

unhealthy eating) and behavioural and emotional difficulties which can lead to social isolation and poor academic achievement (113).

1.7 Prevention of excess weight gain in 0-2-year-olds

1.7.1 The case for early prevention

Interventions to address obesity during infancy and early childhood are relatively new, as parenting, and clinical care have traditionally focused on ensuring sufficient growth rather than preventing its excess. However, persistently high prevalence of obesity in children, the tracking of high BMI from early infancy to adult life, and the emergence of risk factors during early life emphasise the need for early intervention (114). Further, obesity prevention efforts are more likely to be effective when the infant's biological systems are most responsive to change and before obesogenic behavioural patterns are established (115). Parents have a central role in shaping children's food preferences and eating behaviours, and also patterns of physical activity and sedentary behaviours that emerge during infancy and track through childhood. By targeting parents as agents of change, early interventions have the potential not only to establish healthy weight trajectories in the child but also to support positive parenting practices and parent-child relationships, and to influence healthy lifestyle habits, food preferences and eating behaviours for the family (116). Furthermore, targeting early life risk factors within their socioeconomic context through appropriate interventions can contribute to reducing inequalities in childhood obesity (117).

1.7.2 Interventions for preventing excess weight gain in 0-2-year-olds

Child obesity prevention interventions have tended to focus on school aged children, by which time many children are already overweight or obese. More recently, there has been a rapid increase in interventions that have targeted either the first 1000 days of life or children aged 0-2 years, as summarised in the evidence synthesised by several systematic reviews (118-121). The evidence from this body of research suggests that interventions delivered by trained health professionals which target established risk factors for rapid infant weight gain (described earlier) can improve infant/child diet and feeding practices and children's physical activity, sleep, and sedentary behaviours. In particular, interventions such as promoting responsive feeding practices and lowering the protein content of formula milk may help to reduce the risk of later obesity in infants who are not breastfed (1, 118, 120). A recent

review which explored the implementation of interventions aimed at preventing rapid weight gain during infancy found that interventions tend to have more impact on weight gain during the first year of life (as compared with the second year of life) and, to be effective, they need to consider contextual factors (social norms and beliefs related to infant/child feeding practices), parents' preferences about the physical setting of the intervention (home settings are preferred by many parents) and the needs of the healthcare practitioners (their professional identity and every day practice routines) who deliver the interventions (122).

The field of prevention of excess weight gain during the first two years of life is evolving. There are uncertainties about how effectiveness of an intervention may be influenced by the timing of intervening, intervention content and the duration of exposure (1, 123). There are also uncertainties about what risk factors should be prioritised to target with an intervention, whether the effects are likely to be sustainable over time, and whether the effects are generalizable within a particular population group or across different population segments. Selection of a priority target for an intervention may not be a straightforward decision. For example, the benefits of promoting breastfeeding on child health are well known. Yet low-income families are much less likely to meet breastfeeding recommendations and are also at increased risk for childhood obesity. It can be challenging to decide whether to devote limited resources to promote breastfeeding in these families or to promote healthier practices in the context of their existing practices (such as formula feeding and complementary feeding) (124).

1.7.3 Policy context on prevention of excess weight in 0-2-year-olds

Childhood obesity prevention has been a policy priority in England for more than 20 years. In 2018, the department of Health and Social Care declared its ambition to halve childhood obesity prevalence in England and "significantly reduce" the inequalities gap by 2030. Several national policies have focused on health of 0-5-year-old children (125). England's breastfeeding policy aligns with recommendations of the WHO and is supported by NICE guidelines and the UNICEF UK Baby Friendly Initiative. Breastfeeding and child healthy weight are priority agenda items for the government; breastfeeding initiation rates and its prevalence at 6-8 weeks after birth, and weight status of children at school entry are key measures in Public Health England (PHE) outcomes framework (126). Several prominent

national actions support the achievement of these outcomes. They include the Healthy Child Programme 0-5 (HCP 0-5), Healthy Start scheme, social marketing campaigns (“Change4Life” and “Start4Life”) and early year interventions such as the Family Nurse partnership (for at-risk mothers and their 0-2-year-olds). A mapping study (127) of the childhood obesity prevention policies in England from a behavioural science perspective found that government policy activity to address obesity prevention in pre-school children is focused more on education (information provision) and with emphasis on individual’s responsibility for behaviour change, and less on enabling individual-level behaviour change (e.g., support for implementing behaviour change, access to resources for weight management) and targeting upstream influences (e.g., promoting healthier physical, economic, and social environments).

In a recent Health and Social Care Committee inquiry, professional organisations in England (specifically, the Institute of Health Visiting and the Royal College of Paediatrics and Child Health) have reported that the government’s approach to childhood obesity focuses more on interventions after age 2 than in the crucial first 1000 days (128). For instance, although ‘Healthy Weight’ is identified as one of the six areas where the HCP 0-5 is expected to have a significant impact, currently there is no policy to make use of the weight data of children aged 6 months to 2-2.5 years that is routinely collected as part of the developmental reviews undertaken within the HCP 0-5 service (129). This is despite national studies showing that obesity is often established long before children begin school (130, 131) and recommendations from experts that weight monitoring and recording should start in infancy (129). The recent updated guidance (“All our Health”) for health professionals on childhood obesity prevention further illustrates the lack of focus on the first 2 years; the practices recommended in the guidance are for care involving children aged 2 years and above (132).

More recently, nonetheless, the concept of the first 1000 days is gaining recognition in several public health initiatives in England; examples include the ‘Better Start Plan’ in Leeds, five ‘Better Start’ partnerships supported by the National Children’s Bureau, and the ‘Baby Buddy’ digital app developed by Best Beginnings (133). In the green paper “Advancing our health: prevention in the 2020s” published July 2019, the government has identified several areas for action addressing the health of 0-2-year-olds; these include infant feeding, marketing and labelling of infant foods and reducing sugar content in milky drinks (134).

PHE's strategy for 2020-2025 has identified 'Best Start in Life' as a key priority, with the objectives of achieving better outcomes for children and reducing inequalities. To achieve those outcomes, PHE intends to develop a modernised HCP that is 'universal in reach and personalised in response', with increased focus on the first 1000 days and pre-school years and inclusion of a pre-conception and maternity care pathway (135).

1.7.4 Putting the evidence into practice: the role of 'integrated' primary care

The organisational structures and service delivery models of primary health care vary in different countries. For the purposes of this research, the concept of primary care is based on WHO's definition of 'integrated' primary healthcare: a comprehensive health system which integrates key public health functions (health promotion and preventive care) into existing primary care services (136). The aim of integrated primary care is to provide first-contact access to the health system to promote health, prevent illness, care for common illnesses, and manage on-going health problems. Underpinned by WHO recommendations, integrated models for delivery of comprehensive primary care are currently being piloted across several sites in England (137). The introduction of changes in organisation and strengthening of delivery of care in the community suggest that the role of primary care in the management of chronic diseases is increasingly important. Integrated primary care is considered as a promising setting for childhood obesity treatment and prevention efforts (138, 139).

In England, NHS primary medical care is provided by general practitioners (GPs) and practice nurses at GP-led practices. NHS community health services include universal public health functions (such as health visiting and school nursing services) and specialist/targeted services (such as community child health services). The commissioning of children's 0-19 services (and certain public health services) is the responsibility of local authorities. NICE guidance recommends better cooperation between NHS managers, local authorities, and all health professionals who work in primary care (including GPs) and NHS community health services to prevent childhood obesity (140). Parents across all sociodemographic groups frequently access primary and community care services and consider practitioners who work in these settings as trusted sources of health information and support, for the improvement of child health (141). Existing practitioner-family relationships place the practitioners in a unique position to deliver evidence-based interventions. Practitioners can also connect

children and families to community resources that provide support for developing and maintaining health promoting behaviours. The key role of specially trained nurses in the delivery of parent-led interventions to address excessive weight gain in 0-5 year old children has been demonstrated in numerous programs and trials in the UK and other countries (120, 121). In addition to their clinical role, primary care practitioners' scientific knowledge and trusted community role place them in a position to engage in community-based advocacy and collaborate with the public health community to promote policy change and environments that support healthy weight (142).

1.7.5 The Healthy Child Programme (HCP) 0-5

The HCP 0-5 is a UK-wide public health programme of screening, immunisation, health, and developmental reviews, supplemented by prevention and early intervention for families with 0-5-year-old children, to promote their health and wellbeing and reduce inequalities (143). Health visitors (HVs) who are registered nurses or midwives with additional specialist training in community public health nursing lead on the delivery of the HCP 0-5, working with other community health service providers such as family nurse partnership teams, nursery nurses, early years practitioners and community midwives (144). At the time of its launch in 2009, the HCP 0-5 was based on the best available evidence summarised in the fourth edition of Health for All Children and supplemented with public health guidance from NICE (145). Subsequently, the evidence base informing the programme has been reviewed periodically (146, 147).

Responsibility for commissioning of the HCP 0-5 and other public health services (e.g., the 5-19 HCP which is led by school nurses) was transferred from NHS England to local authorities in October 2015 (148). Following the transfer of the commissioning arrangements, PHE published a detailed specification of the English health visiting service and a new integrated '4-5-6' service model for the programme (149). The HCP 0-5 in England offers a four-level health visiting service based on proportionate universalism, that is, distribution of universal services according to need: community, universal, universal plus, and universal partnership plus (increasing reach from community action to complex needs). The universal services include health and development reviews, surveillance and promotion of child health, immunisations, and support for parenting and health promotion. There is a minimum of five mandatory universal health reviews; these are the antenatal visit (28 weeks onwards); new

birth visit (10-14 days following birth); 6-8-week assessment; 1-year review and a 24-to-30-month review. The aim of each health review is to ensure that, in addition to delivering universal health promotion and preventive care, any potential concerns are identified as soon as possible. PHE has identified six 'high impact' public health outcomes for the HCP 0-5. These outcomes represent areas where health visiting interventions have the potential to improve outcomes and reduce inequalities; two of these outcomes, relevant to the current research, are 'breast feeding' and 'healthy weight, healthy nutrition'(126).

The Institute of Health Visiting (iHV) has emphasised the impact of the ongoing squeeze on public sector budgets on children's services and highlighted issues with the delivery of the HCP 0-5 in England. One issue is the variable implementation of the HCP 0-5 within different areas of England, as measured by the percentage of mothers/children receiving the five mandated reviews. Whilst the devolved nations of Scotland and Wales specify which reviews are to be carried by a qualified HV, there is no such stipulation in England. According to the iHV, in some areas of England as many as 65% of families do not formally see a HV after the 6-8 weeks review and may instead be seen by early years practitioners who have less training in identifying health-related risks (150). This has been attributed to a steady decline in the number of HVs since the move to commissioning of the health visiting service by local authorities. A recent survey of 1040 practising English HVs conducted by the iHV (151) reported that only 2.8% of HVs were able to offer continuity of care 'all or most of the time' to the families on their caseload. Although the iHV recommends a ratio of 250 children per whole time equivalent HV, the survey found that around 23% were responsible for 301-400 children and almost 29% were responsible for more than 500-1000 children. The report also highlighted the difference in the number of mandatory reviews in the devolved nations within the UK. The minimum number of mandated reviews within the HCP 0-5 are currently only five in England; they are significantly higher in Wales (9), Northern Ireland (9) and Scotland (11, all to be carried out only by HVs).

The universal contacts built within the HCP 0-5 provide regular opportunities for HVs to engage with parents to provide anticipatory guidance regarding infant nutrition, physical activity, sedentary behaviours and sleep (143). Nutrition, diet, and weight are sensitive topics that require skilful communications and a relationship based on trust. The home visiting context of the HCP 0-5 facilitates HVs to nurture positive parent-HV relationships and

to allow for families to feel comfortable discussing sensitive issues. HVs are well placed to work with parents to promote healthy nutrition during pregnancy and early years, make holistic health needs assessments, support children and parents to make positive lifestyle changes, and where appropriate, facilitate access to specialist services (152).

1.7.6 Guidelines for prevention of excess weight during early years

Guidance and practical direction to support HVs' role in promoting breastfeeding and 'healthy weight, healthy nutrition' is provided in an evidence-based framework, to reduce the risks of obesity for 0-5-year-old children through the HCP 0-5 (143). This framework includes two main themes (each with several subthemes): development of healthy lifestyle and enhancing practitioners' effectiveness. The NICE has published several evidence-based guidelines for primary care health professionals (including HVs) which provide recommendations for good practice on maternal and child (for 0-5 year olds) healthy weight and healthy nutrition, and prevention of obesity in children ≥ 2 years old. NICE recommends that practitioners take the guidelines into account during their decision making. The recommended practice behaviours and relevant NICE guidelines for prevention of excess weight development in children aged 0-5 years are outlined in Table 1.1 (on following page).

The NICE guidelines for identification, assessment and management of obesity cover children aged 2 years and over. Currently, there is no national requirement to identify 0-2 year old children with excess weight (153). There are tools that practitioners can use for prevention of childhood obesity in primary care (154); however, no tools are currently recommended within the universal HV service for obesity prevention in infants. Guidance for HVs in the context of their role in promoting child healthy weight is also provided in PHE resource "Early Years High impact area four: healthy weight, healthy nutrition" (149). PHE has also published additional resources for HCP 0-5 staff (155, 156) to ensure consistent messaging on key topics such as infant feeding, diet and nutrition, sleep, physical activity, sedentary behaviours, and guidance on methods ('Make Every Contact Count' and the three-step 'Ask, Advise and Assist') to engage with parents in healthy weight conversations, assess parental and child motivation to change, support and empower parents to make healthy choices, and deliver appropriate interventions.

Table 1.1 Summary of NICE guidelines for health visitors. (Context: prevention of risk of excess weight gain in 0 to 30 months old children); NICE uses a guideline numbering and naming system for easy referencing of the guidelines (157); [Abbreviations: PH=Public Health; CG=Clinical guideline; NG= National guideline; BMI= body mass index]

Time and place of visit	Recommended practice behaviours	NICE guidelines; comments
Antenatal visit at home; (health promoting visit): 28-32 weeks of pregnancy	<ul style="list-style-type: none"> • Offer advice and support to women with a BMI greater than 30 kg/m² • Introduce key messages for prevention of overweight for mother and baby; discuss healthy weight expectations; encourage and promote breastfeeding • Provide advice about responsive bottle feeding for mothers who choose to bottle feed • Explain growth charts in parent-held Personal Child Health Record (PCHR), signpost to healthy weight guidance • Advice and information about Healthy Start vitamins and vitamin D supplementation 	PH27 (maternal weight management)(158); PH 56 (Vitamin D supplementation)(159); CG 37 (breastfeeding/formula feeding advice)(160); PH 11 (maternal and child nutrition) (57); complements care provided by midwifery services
New birth visit (10-14 days) at home	<ul style="list-style-type: none"> • Measure weight, length of infant; interpret and monitor child growth • Promote and support breastfeeding; provide advice about responsive feeding when indicated • If faltering weight is identified, refer to national and/or local protocol for management • Promote Healthy Start vitamin supplementation • Signpost to the Infant feeding and healthy weight advice pages in the parent held PCHR 	CG 37; PH 11; NG 75 (management of faltering weight) (161); outcomes of this visit enable the HVs to devise a suitable care plan for follow-up
6-8 week assessment; at home or in a clinic	<ul style="list-style-type: none"> • Assess the baby's growth and wellbeing and the health of the parent • Provide information about when to introduce solids; reinforce advice about responsive feeding • Reinforce key messages for the prevention of obesity and healthy weight expectations 	CG 37; PH11; NG 7 (prevent excess weight gain in children, post weaning) (162); GP led medical review also takes place at this time
1-year assessment (9-12 months); at home or in a clinic	<ul style="list-style-type: none"> • Assess growth including weight and length; identify children who are overweight/obese/ experiencing faltering growth; record and interpret results using the centile charts within the PCHR • Using a partnership approach, assess infant's feeding and nutritional intake; promote healthy family mealtimes and appropriate portion sizes • Using "Make every contact count" (MECC) principles, promote healthy nutrition, Healthy Start and vitamin supplementation, and appropriate physical activity 	PH11; PH56; PH17 (promote physical activity) (163); NG7

Time and place of visit	Recommended practice behaviours	NICE guidelines; comments
1-year assessment (9-12 months)	<ul style="list-style-type: none"> • Offer advice, and initiate a care plan if on-going support or growth monitoring is indicated, plan with parents a growth monitoring review at an agreed time frame • In partnership with the family, set care plan goals and identify interventions (for example, portion sizes, milk volume and physical activities (active play)) 	PH11; PH56; PH17 (promote physical activity) (163); NG7
24-30-month review; at home or in a clinic/ health centre/ nursery	<ul style="list-style-type: none"> • Assess growth including weight, height, and BMI (from the age of 2, BMI can be calculated and plotted on the appropriate chart) • Record results in the PCHR and patient’s record and interpret using the centile charts within the PCHR • Explain the centile charts and the results of measurements using a strength based, non-judgmental approach and MECC principles • Offer support and advice as outlined in the healthy weight pathway protocol for children identified as overweight or obese • Offer advice to parents about healthy diet (nutrition and portion sizes) and physical activity levels for the 2-year-old child as per guidelines 	PH11; NG7; PH17; CG189 (identifying and assessing risk of overweight in children aged ≥ 2 years) (5); CG43(obesity prevention in children aged > 2)(140) Early Years staff may also carry out an Early Years Foundation Stage progress check at 2 years.
Monitoring of growth; at home or in a clinic/ health centre/ nursery	<ul style="list-style-type: none"> • If parents wish, or if there is professional concern, babies can be weighed at 6–8 weeks, 12 and 16 weeks • Babies should be weighed <i>no more than</i> once a month from 2 weeks to 6 months of age; once every two months from 6 to 12 months of age; once every three months over the age of 1 year • Babies should usually be weighed at 12–13 months at the time of routine immunisations • Most children do not need to be weighed this often; reassure families that they can attend the local child health centre for advice without having their baby weighed • Measurements need to be interpreted in relation to length, growth potential and any earlier measurements of the baby 	PH11; NG75; (supplemented by NHS guidance for HVs and parents on infant health and development reviews)

1.8 Health visiting: principles and practice

Health visiting is distinct from traditional nursing by its emphasis on proactive search for health needs (rather than responding to demand for care); on primary prevention and health promotion (not on treatment); and its role in improving health of the population as well as individuals (152). The process of health visiting is informed by an integrated framework of four guiding principles which reflect the broad objectives of the profession and represent key health visiting actions for promoting health, preventing disease, and reducing health inequalities:

1. Searching for health needs (this extends beyond the individual, to the context within which the individual lives, e.g., access to resources and income)
2. Raising the awareness of health (with individuals and communities, with commissioners and providers of services, and with policy makers)
3. Influencing on policies affecting health (advocate for those with health needs; this role is supported by HVs' access to health related information, by acting as a resource for change and by actively participating in the change process)
4. Facilitating health enhancing activities (enable people to shape their own futures; not focus only on individual's behaviours but also address the environment within which families live).

1.8.1 Health visitors' approach to practice

The health visiting literature describes a particular approach to practice that reflects the philosophy and values of the profession (164). This 'orientation to practice' is characterised by: (1) adopting a salutogenic approach (focusing on health creation rather than on illness); (2) human valuing (maintaining a non-judgmental positive regard for the person irrespective of their health behaviours and beliefs); and (3) acknowledging the person-in-context (recognising the impact of social and economic determinants on health behaviours). HVs aim to demonstrate this approach in all four core health visiting practices that are identified as home visiting, relationship formation, health needs assessments, and community-based health visiting (165). Health visiting practice does not have a fixed site or place of work. A lot of the routine work of HVs takes place within areas that are not controlled by HVs, such as services users' own home or community settings, where institutional structures and

technologies of surveillance and access control are lacking. The physical and social characteristics of HVs' work settings can have implications for practice – particularly, the way power relationships are formed and managed between HVs and the family (166).

Although there is substantial literature on the concepts and theories underlying health visiting (what HVs aim to do) and evidence *for* best practice in health visiting (what HVs are *supposed* to do), there is limited published research about how HVs carry out their practices (what HVs *actually* do) (167). Health visiting services routinely collect data for key performance indicators as defined by national health visiting core service specification (168). These indicators focus on the number of core contacts achieved (e.g., proportion of children who received their first year review); however, this data does not describe all health visiting activity and does not provide information about outcomes for children and families. A review of the empirical literature on health visiting acknowledged the lack of evaluative research on how HVs deliver the practices required to achieve the outcomes of universal health visiting (152). Various factors have been suggested for the lack of good quality research on health visiting practice, including limited research capacity within health visiting, lack of funding for research, and the lack of a theory base which makes it difficult to demonstrate the effectiveness of HVs' actions (167, 169). The lack of a coherent evidence base for health visiting practice has been cited as a factor in its under-developed academic base, limited presence in universities (particularly at a professorial level), and lack of high-impact journals devoted to UK public health nursing (170).

1.8.2 HV's public health nurse role

UK policies frame health visiting as a model for family-centred public health nursing (126). There are clear parallels between the principles of health visiting and the core components of public health (namely, population perspective, health promotion and disease prevention, and the role of wider determinants of health). However, HVs experience the implementation of their public health role as challenging (171). HVs believe they have to work within a policy agenda that focuses on individualised approaches to behaviour change (whether carried out at the family or community level) and minimises the opportunity to address the socioeconomic environment in which these behaviours occur (172). HVs contend that individual-level approaches are less likely to work (unless wider determinants of health are also addressed), may cause psychological harm to people who feel they lack the capacity for

behaviour change, and may result in widening of health inequalities (people who are socioeconomically advantaged are more likely to respond to healthy lifestyle interventions than those who are socioeconomically disadvantaged).

HVs experience a sense of conflict between their role in implementing the local and national public health agenda (for example, meeting public health targets such as smoking cessation or breastfeeding rates, set by the provider organisation) and their professional code of supporting a client's (this could be an individual, a family or a community) assessment of their own health needs and supporting community action to address those needs (142). A study (173) which explored HV's experiences and management of ethical tensions arising from their public health role found that HVs acknowledge that organisational targets drive resource allocation and work priorities; although this was perceived as helpful in certain situations, a target driven approach restricted their ability to respond to health needs of individuals and families. HVs who took part in the study reported that they considered it inappropriate to raise topics that are identified as public health priorities by the organisation with clients who do not consider the topics as priorities or who may have other urgent priorities (173). HVs reported they felt pressured to achieve targets because organisational protocols are often designed to monitor individual HV performance (rather than organisational performance) against standardised targets; this adversely affected HVs' sense of professionalism and the HV-client relationship.

Various inter-related factors have been identified as potential constraints to HV's community public health role in the health visiting literature (171, 172). They are: prioritisation of HV's traditional role (focus on individual and family health) in the reality of every day practice, perceived lack of skills (e.g., negotiation and influencing skills) required for working in partnership with community organisations, lack of resources (budgetary constraints), lack of training, limited professional autonomy, own workload pressures, competing organisational priorities, lack of cooperation from other professional groups, and lack of health visiting leadership. Conversely, availability of adequate resources, strategic leadership (setting of realistic priorities for public health) and a supportive working environment have been identified as facilitators of the HV's public health role (174).

1.8.3 HV – parent relationship

As indicated in 1.8.1 above, relationship formation is one of the four core health visiting practices. Health visiting services are typically provided unsolicited (i.e., without being requested) and therefore, to achieve parental participation, a positive HV-parent relationship based on trust is essential. There is a large body of literature which emphasises the importance of positive relationship formation with parents, families and communities to achieve the objectives of successful health visiting (152, 175). Relationship formation is important also for parents who consider a positive HV-parent relationship as vital for meaningful partnership working and for parents to feel genuinely empowered (176).

The internet and social networking websites are now important sources of information for parents when making decisions about parenting and infant care, and for some parents, these sources may be more trusted than health professionals (177). HVs have reported lack of confidence in engaging with critically minded parents who appear to be knowledgeable and more likely to question and dispute evidence-based guidelines, and have expressed concern that parents are less likely to engage with HVs if they perceive that HVs are not respecting their choices (178). These findings emphasise the importance of HVs' ability to establish relationships of trust and communicate health messages, especially in situations where parents' beliefs and concerns vary from the official recommendations. Various factors potentially facilitate the process of developing and maintaining positive HV-parent relationships. These include HV's personal attributes (perceived by service users as empathic, respectful, with personal integrity, enthusiastic) and skills (particularly communication and problem management skills), and qualities and skills of parents (trust in HV, openness, and interest) (176, 179). Additionally, various organisational factors can potentially facilitate the relationship building process (180); these are continuity of care, more home visiting (as opposed to seeing clients in clinic settings), smaller caseload sizes and smaller teams, support from management and productive partnership working with other agencies. In contrast, busy clinics with no staff continuity, lack of time, and the burden of administrative tasks such as record keeping (both paper records and electronic records are sometimes required to be maintained) have been identified as barriers to relationship building.

1.8.4 HVs' use of guidelines and protocols

The protocols which provide guidance and direction for health visiting practices represent the evidence generated from primary research. Another way in which HVs generate and share knowledge to inform their clinical work is from practice-based learning, also known as reflective practice (169). A study which explored HVs' use of formal guidelines found that many frontline HVs regard official guidelines and protocols as tools for communication between practitioners and management, and used by managers as elements of control (181). HVs held the view that a lot of the evidence underpinning guidelines is context-specific and contestable, and that the relevance and applicability of guidelines in the local context should be critically assessed jointly by frontline HVs and their managers before they can be embedded into practice. The study's findings suggested that HVs experienced conflict between their professional judgments and the official protocol and were likely to reject the protocol in favour of practices they considered best practice to address the health needs of the family. Various other barriers have been reported in the health visiting literature to HVs' use of guidelines (173, 182, 183); they include barriers related to HVs (lack of time, lack of skills and confidence, lack of awareness of guideline content, limited use of the guideline by peers, and the belief that there is limited evidence that the guideline contributes to beneficial outcomes for the patient); to the practice setting (complex home environments which make it difficult for HVs to engage with parent and child); and to the provider organisation (little involvement of HVs in guideline development, lack of communication about updated guidance).

1.9 Supporting practitioners' implementation of guidelines.

Practice guidelines exist to support practitioners' clinical behaviours, to facilitate the delivery of evidence-based and patient-centred care. However, it is widely acknowledged that practitioners do not routinely implement evidence-informed practices and many continue using interventions that have little or no evidence underpinning them, and rely more on their experience than on research (184). Practitioners are less likely to implement a guideline if they believe that the benefits are not worth the burden (for them and/or the client) and cost (use a lot of their time), reduced their autonomy, or if they perceived that the client may perceive the recommendation as offensive or embarrassing (185). Diet and lifestyle behaviours and in particular, infant feeding practices and child eating behaviours are

sensitive topics. This is due to the stigma attached to obesity which exists due to beliefs that it is due mainly to lack of personal responsibility and poor eating and lifestyle habits (186). Comments made by a health practitioner about a child's weight can be perceived by parents as critical and judgmental and in turn, evoke feelings of self-blame and parental failure (187). These perceptions can lead to parents avoid or minimise the subject of overweight in their child. At the same time, practitioners fear that raising the topic of weight will upset or alienate parents and cause harm to the parent- professional relationship. Primary care practitioners who have a role in childhood obesity prevention have described lack of skills and confidence in engaging with parents to discuss weight related topics, especially if they lacked relevant training and resources and if parents are overweight themselves and/or perceived as not motivated (188, 189).

Evidence from systematic reviews (190, 191) indicates that various organisational factors can influence health professionals' practices to address childhood obesity prevention in primary care. Practitioners have identified the lack of time and practice tools, competing priorities and increased workloads, lack of clear protocols for different primary care practitioner groups, and lack of organisational support as key barriers. Key facilitators identified by practitioners include training in obesity prevention and communication skills, pre-existing trusting practitioner- patient relations, presence of clear protocols, support from colleagues, managers and other health practitioner groups, availability of resources (sufficient time and practice tools), and supportive leadership and organisational culture. The findings from these reviews imply that interventions and strategies for addressing childhood obesity prevention in primary care should include a focus on both individual (i.e., the practitioners) and environmental factors (i.e., factors within and outside of the provider organisation), and also consider the role of the local context (such as availability of resources and supports for the population).

1.9.1 Interventions to support guideline implementation

Increasing awareness of the importance of bridging the gaps in evidence-based care has driven a significant programme of research to increase the adoption of guidelines, for the overall goal to improve quality of care and improve patient outcomes (192). Increasing the adoption of evidence based care requires change at one or more of organisational, practitioner or patient levels. Interventions that are used to enhance the routine and

sustained use of guidelines in delivery of healthcare are known as implementation interventions. Interventions at the level of the individual practitioner are designed to support health professionals to change their behaviour, to modify current patterns of practice (193). These interventions are frequently complex, consisting of multiple interacting components and operationalised in complex organisational and policy context of healthcare systems (194). The complexity also involves the behaviours of those providing and receiving the intervention, and the variability in their outcomes. Implementation interventions at individual practitioner-level have been used in diverse clinical settings and health disciplines including primary care (195, 196), to target a range of clinical behaviours including disease screening and management, preventive care, and obesity management (197, 198).

The effects of interventions to change the behaviour of health practitioners and organisation of care vary widely, but it is not clear why these variations occur. A theory-led overview of systematic reviews of interventions (199) has provided insights as to why some interventions are more likely to be successful in changing health practitioner behaviours than others. This research found that effective interventions were those that used strategies (e.g., educational outreach) to modify practitioners' social or peer group norms (namely, implicit, and explicit rules that a practitioner group uses to determine the group's values, beliefs, attitudes, and behaviours) and then reinforced the modified norms by using strategies (e.g., audit and feedback) to draw the attention of practitioners to the values, beliefs, attitudes, or behaviours of a reference group or standard. The overall strategy of successful interventions was to reset the rules and modify existing norms about the conduct of the target behaviours so that performing those behaviours was then considered as normal routine of everyday work. In contrast, interventions that used only persuasion, to reshape practitioners' views and attitudes (e.g., local consensus building, opinion leaders) were less likely to be effective.

There is now a large body of literature comprising numerous clinical trials of single and multi-faceted implementation interventions aimed at promoting health professional behaviour change and improving delivery of care (195-197, 200, 201). This body of research has emphasised the difficulties in evaluating and comparing different interventions and strategies and in drawing definitive conclusions about the effectiveness of specific interventions. This is attributed to the heterogeneity of the studies (196, 200, 201), issues with reporting of studies (insufficient information about intervention content) (195, 201),

varying methodological quality of studies (196, 200), inconsistency of results between and within trials (197), varying outcome measures of the studies (most studies reported on change in knowledge and beliefs but few reported on change in practice behaviours or the practice environment) (196, 200), and key evidence gaps (e.g., lack of evidence of directly comparing the effectiveness of different professional-level interventions, limited data on evaluation of delivery of the intervention and limited information about the influence of key contextual attributes such as organisational culture)(195, 197).

Nevertheless, the evidence synthesised by two recent reviews of systematic reviews of implementation interventions (195, 196) targeted specifically at primary care practitioners has identified several strategies that have the potential to successfully change professional behaviours and patient health outcomes. The evidence shows that single-strategy interventions that, on their own, demonstrated small or modest improvement in professional practice were audit and feedback, reminders, and educational interventions such as educational outreach visits. Improved collaborative team-based approaches (involving doctors, and nurses) were also found to be effective (196). The effects of multifaceted strategies were variable – some studies found them to be more effective than single strategies but other studies found no difference or that they were only slightly more effective in changing practice (195, 196). Multifaceted strategies such as interactive education and training programmes combined with audit and feedback, and clinical decision support tools were found to be beneficial in improving practitioners' knowledge and practice patterns, and patient outcomes (196). The evidence for environmental restructuring approaches (for example, the use of collaborative or shared care practices, and organisation of specialised nurses/allied health practitioners-led care for management of long term conditions) in improving quality of care and adherence to guidelines was weak (not conclusive). The use of modelling (using local opinion leaders alone or together with other strategies) was reported as modest and variable (ranging from negative, no effect, to small and large effects) across different studies. Passive interventions such as distribution of educational materials were not helpful.

Most primary studies included in these reviews which reported on the effect of financial incentives were conducted in the USA. Financial incentives combined with educational interventions and/or audit and feedback were found to be beneficial (though the effects

were variable and modest at best) in improving prescription behaviours of family physicians in some studies but were not effective in producing long-term behaviour change. These findings may have limited applicability to other healthcare systems (for e.g., in the UK where the NHS is largely funded from general taxation).

1.9.2 Supporting PCPs' role in childhood obesity preventive care

There is substantial evidence that education and training and provision of appropriate resources can strengthen the capacity of primary care practitioners to effectively deal with barriers and engage with childhood obesity prevention practices (202-204). Specifically, interactive training interventions which provide opportunities for skills development, encourage reflection on practice, and draw practitioners' attention to difference between current practice and desired standards have the potential to improve outcomes for practitioners (professional development) and patients (203, 205). More recently, health psychology-informed skills training interventions targeted at health and social care practitioners (206), medical students (207) and student midwives (208) have shown promise in improving their confidence, competence, and intention of engaging with clients in having conversations regarding healthy lifestyle and behaviour change.

Strategies aimed at improving integration of guideline recommended practices into routine service delivery for prevention of excess weight in pre-school children in primary care need to address organisational and financial considerations of implementation, for them to be effective and sustainable (209, 210). This may require change in service provision (expansion of existing services to enable early recognition of at-risk children); improved training and education packages and practice tools for staff (for e.g., decision support tools and information systems); protocols and pathways for a collaborative, unified approach among different practitioner groups; and support systems to overcome barriers for parents who are attempting to implement change.

1.10 The setting for the research in this thesis

This research was funded through a collaboration between Newcastle University, Durham County Council (DCC) and Fuse, the Centre for Translational Research in Public Health. In October 2015, the commissioning of the HV-led HCP 0-5 service (along with the school nurse-led HCP 5-19 service) was transferred from NHS England to local authorities. The

timing of this transfer coincided with County Durham being selected as one of four pilot local authorities to develop and implement a whole systems approach to address obesity. County Durham's Healthy Weight Alliance identified 'best start in life' (BSIL) which focuses on the health and wellbeing of 0-2 year olds, as one of four strategic themes for development as a mechanism to demonstrate progress in the County's implementation of the whole system approach (211, 212). HVs who lead the HCP 0-5 have a crucial role in BSIL and form part of the whole system approach to healthy weight, healthy nutrition in 0-5 year old children (144). Under its BSIL action plan, DCC's Public Health department considered the development of an intervention to strengthen HVs' role in prevention of overweight in 0-2 year old children as a relevant area for research, based on feedback from practitioners who work with families in County Durham (212). The Director of Public Health at DCC took the decision to develop this PhD research in partnership with Newcastle University to support professional practice development of practitioners and understand the challenges of excess weight gain in 0-2 year olds.

1.10.1 County Durham profile

County Durham is a large and predominantly rural area in Northeast England with a significant coal mining and industrial heritage. The County is home to an estimated population of just over 530,000 (2019 estimates); children aged 0-4 years constitute around 6% of the population (213). Like all other Local Authorities (LAs) across Northeast England, County Durham has experienced an increase in deprivation (by rank) since 2015. In 2019, the County Durham was ranked as the 48th most deprived upper-tier LA out of 151 nationally (it was ranked 59th in 2015). Analysis of government data suggest that child poverty figures have increased across all of Northeast England (214). It is estimated that in 2019, 22.3% of children were living in poverty in County Durham, an increase of 5.8% since 2015. Health inequalities are strongly linked with the socioeconomic profile of the population. The NCMP data for the year 2018-2019 show that the prevalence of overweight (including obesity) in children aged 4-5 years in County Durham (24.9%) was higher than the national average (23%), with significant socioeconomic disparities within different areas in the County (27). Further, the health profile data for County Durham (for the period 2018/19) show that the prevalence of several modifiable risk factors for childhood obesity are higher (or worse) in County Durham than the average for England (215). These include higher prevalence of obesity in adults (63.3% versus 62.3%), obesity in early pregnancy (28.6% versus 22.1%),

maternal smoking in early pregnancy (21.4% versus 12.8%), smoking status at delivery (16.8% versus 10.6%); and lower prevalence of infant's first feed breastmilk (50.4% versus 67.4%), and any breastfeeding at 6-8 weeks (27.8% versus 48%).

The healthy weight strategic framework for County Durham 2014-2020 has identified excess weight in children, young people, and adults as a priority public health area that needs to be addressed (216). The County's Health and Wellbeing Board's vision is to stop the rise in obesity prevalence in the County by 2022, to address inequalities, and to achieve a sustained decline in obesity rates locally below England's national average by 2025 (211). The delivery of the HV-led HCP 0-5 in County Durham has undergone several organisational and structural changes during the course of this research. From April 2016 until August 2020 (the data collection for this research took place between April and November 2019), the HCP 0-5 was delivered in County Durham by the Growing Healthy Team, Harrogate, and District NHS Foundation Trust (HDFT) as part of an integrated HCP 0-19 (School Nurses delivered the 5-19 component of the HCP). This integrated 0-19 HCP was delivered by a skill mixed workforce led by specialist community public health nurses and enhanced by clinical champions and thematic lead roles. During 2018-19, in addition to the five universal mandated contacts in the national HCP 0-5 (described earlier in section 1.7.5), two additional contacts were delivered in County Durham: at age 3-4 months and a 'pre-school review' at age 3.5 years (217). From September 2020, following a new contract agreement between DCC and HDFT, the HCP 0-19 services have been integrated within a newly designed 0-25 Family Health Service. Within this service, the family health visiting teams are expected to offer ten routine HCP contacts for all children up to the end of reception year in school (including to children not in education settings).

1.11 Thesis aims and objectives.

The overarching aim of this research was to design a theory- and evidence-based intervention for HVs (particularly those who work in County Durham) to strengthen their role in prevention of early childhood obesity. This thesis describes the stages and methods of incorporating multiple sources of evidence collected from research and professional stakeholders, and use of the Behaviour Change Wheel (218) to develop a theory-based implementation to promote HVs' implementation of practices recommended for prevention of excess weight gain in 0-2 year old children. From the outset, the focus was on designing

an intervention that is likely to be feasible and acceptable in the local (County Durham) context. Therefore, incorporating perspectives of professional stakeholders throughout the designing of the intervention was an essential component of this research.

There were three objectives to address the research aim:

1. Conduct a systematic review to synthesise the available evidence on current practices and the barriers to and facilitators of primary care practitioners' implementation of guideline recommended practices for prevention of obesity in 0-5 year old children (Study 1).
2. Co-design with HVs (the recipients of the intervention) a potentially feasible and acceptable implementation intervention (Study 2) informed by theory and existing evidence.
3. Develop a protocol for a feasibility study of the intervention.

1.11.1 Thesis outline

The thesis describes the two studies that were undertaken as part of the intervention development process. To achieve the aim and objectives of the thesis, the research that was carried out is reported in the remaining chapters of this thesis:

Chapter two: Methodology. This chapter presents an overview of the approach (evidence informed co-design), process (interactive stakeholder workshops) and theoretical framework (Behaviour Change Wheel) that were used in this research to develop the intervention, guided by the steps detailed in the UK Medical Research Council framework for the development phase of a complex intervention.

Chapter three: Systematic Review. This chapter presents the methodology and findings of a mixed methods systematic review (Study 1) conducted to examine barriers to and facilitators of implementation of practices recommended for prevention of development of obesity in 0-5 year old children, as perceived by primary care practitioners.

Chapter four. Designing of the intervention. This chapter describes the stages and methods of incorporating multiple sources of evidence collected from research and professional stakeholders (Study 2) to co-design a theory- and evidence-based behaviour change intervention aimed at health visitors to strengthen their role in prevention of excess weight gain in 0-2 year old children.

Chapter five. Feasibility study protocol. This chapter sets out a feasibility study protocol to assess feasibility and acceptability of the newly developed intervention.

Chapter six. Discussion and critical reflections. This chapter discusses the principal findings of the thesis in relation to the research objectives, the methodological strengths and limitations of the approach taken, and recommendations for future research.

Chapter 2. Methodological overview

2.0 Introduction

This chapter provides an overview of the approaches and methods that were used to iteratively develop a complex intervention for health visitors (HVs), with the aim to strengthen their role in prevention of excess weight in 0-2 year old children. The intervention was developed by combining theory, stakeholder involvement, and best available evidence of barriers to and facilitator of HVs' practice behaviours. The UK Medical Research Council (MRC) framework for the development phase of complex interventions (219) was the overarching guide for this work. The chapter describes the elements which comprise the development phase of this framework and its application in this thesis. The methods used in different stages of the development of the intervention are described in greater detail later within relevant sections in the corresponding thesis chapters (Chapters three and four). The terms 'development' and 'design' are sometimes used interchangeably in the implementation science literature, to describe the process through which an idea or a plan for a new complex intervention progresses to the point where it is ready for feasibility testing (220). In this thesis, the term 'design' has been used to refer to the specific part of the overall development process where ideas were generated, and decisions were made about intervention content, format, and delivery.

2.1 Philosophical orientation of this research

Prior to making methodological choices to answer the research question, it is appropriate to address the philosophical question of what constitutes knowledge and how phenomena should be studied (221). Ontology is concerned with the nature of reality while epistemology considers the researcher's approach to and justification of how knowledge can be acquired. Methodology refers to the strategies and techniques adopted to explore lines of inquiry that are related to the research question (222). Together, ontology, epistemology, and methodology define the research paradigm – a philosophical perspective that represents the assumptions of the researcher. Researchers have suggested (223) that patient care processes have a dual perspective: "the care process in itself appears to be an "objective", manageable reality (a logical sequence of activities) that is carried out by healthcare staff with their own individual "subjective" understanding of the care process, its purposes, their

roles and organisational constraints". This dual nature of the phenomenon of implementation of care practices implies that research exploring practitioners' clinical behaviours requires a philosophical foundation that is cross-paradigmatic. Following the literature on philosophical foundations of research on supporting implementation of practices in healthcare (222, 224) and the subject of this research (HVs' practice implementation behaviours), I have adopted "subtle realism" (225) as the ontological and epistemological basis of this research. This post-positivist realist position proposes that an independent reality exists, and that objects (care practice behaviours), relationships and experiences can be studied; however, the knowledge of that reality cannot be directly accessed because it is constructed by observations and perceptions that are subjective. Thus, the subtle realist position involves the researcher to explore and represent this socially constructed reality rather than attain the "absolute truth" about the phenomenon under investigation.

2.1.1 Rationale for selecting the subtle realism approach

The subtle realism position was appropriate for this research because:

1) Suitability for investigating the research question: Subtle realism accept that phenomena can be represented from multiple perspectives. It provides a philosophical foundation for cross-paradigmatic research and methodological triangulation. Thus, it enables the researcher to view evidence-based care as a social phenomenon from the perspective of the end-users, i.e., accommodate their "subjective" views (223).

2) Suitable for the researcher: Subtle realism offers a middle position between positivism and constructivism (relativism). It acknowledges that the researcher's own background and personal experiences shape interpretations of the research findings but avoids in-depth application of social constructivism to the research process (226). This ontological stance was beneficial for me because, as the researcher I could not detach myself from the social context of the phenomenon (guideline implementation) to study it. At the same time, I did not aim to place undue emphasis on the social construction of the emerging data.

3) Flexible approach to what counts as knowledge: Guideline development and evidence-based care are dominated by research that has a strong positivist perspective. This perspective can miss the importance of socially constructed, context-dependent knowledge

(experiential knowledge) that is used in practice by healthcare professionals. By enabling a dual perspective of evidence-based care, a subtle realism approach offers a flexible approach to what counts as knowledge (222).

4) Suitability for healthcare research and potential contribution: Subtle realism is regarded by methodologists (227, 228) as an important epistemological perspective in healthcare research. The subtle realist approach has been used to conduct research in healthcare settings to explore practitioners' knowledge utilisation and delivery of evidence-based care (223, 229).

5) Assessment of the quality of the research: In subtle realism, the purpose of research is to provide valid and non-contradictory descriptions of the phenomenon (as opposed to offering an absolute certain truth). My role (as the researcher) was to ensure that the findings generated from the research are relevant and credible. From my review of the literature, I concluded that the methods and processes recommended for demonstration of validity and quality of research based on the subtle realist approach (230) could be practically applied to this research. These criteria and their application in this research are presented later in this chapter (section 2.6).

2.1.2 Methodology: Mixed methods

The methodology and methods for a research project should be selected based on their ability to answer the research questions and achieve the objectives of the research. The aim and objectives of this research demanded the use of both quantitative and qualitative methods (231). Mixed methods research involves the combination of qualitative and quantitative methods to study design, data collection, and data analysis (232). Combining different research methods and analytical techniques from both quantitative and qualitative paradigms is compatible with the subtle realist position (222). Beyond the use of quantitative methods, qualitative methods can: provide detailed and comprehensive understanding of various processes of intervention development; explore the complexities of the social world of healthcare practitioners and implementation of care practices in real world settings; assess context and processes involved in behavioural interventions; and indicate acceptable and sustainable ways to implement and disseminate the intervention. The use of mixed methods was therefore an appropriate approach for this research. Furthermore, the mixed methods research design sits well within the multiphase model of

intervention development that is advocated by the MRC for complex intervention development. In fact, the MRC framework states that “wherever possible evidence should be combined from a variety of sources that do not share the same weaknesses” (219). Both the systematic review and the intervention development work conducted in this research recognised the value of mixed methods research.

A wide range of approaches for classifications and types of mixed methods designs have been advanced by methodologists. These classifications and the names of the designs have evolved over time. Currently, three core study designs are described in mixed methods research conducted in healthcare settings: convergent, explanatory sequential and exploratory sequential (232). The mixed method design adopted for this research aligns with the “convergent design” typology in which the quantitative and qualitative strands are implemented concurrently; both strands have equal emphasis, and the results of the separate strands are converged. Implementing the convergent design involves four key steps as shown in Figure 2.1 below:

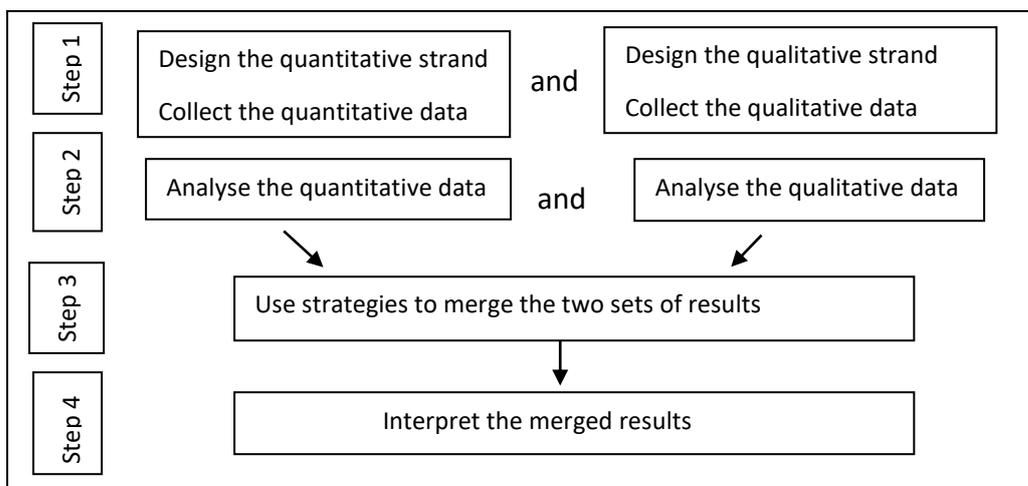


Figure 2.1 Flowchart of the process of the convergent mixed methods design (232)

The convergent design was selected after considering the research project’s goals, research questions, the methodological framework, methods, and validity considerations (233). The convergent design was considered as an appropriate approach because:

1. It is useful for comparing quantitative results with qualitative findings for a comprehensive understanding of the research question.
2. It is a useful design for corroborating data generated from different research methods.

3. Both types of data are collected simultaneously during a single interaction with the participant; this helps save time for both researcher and the participant.
4. It is a useful design when both quantitative and qualitative forms of information are needed from *every* participant.

The strategies and approaches that were employed to pursue the objectives of this research (summarised in this chapter and described in greater detail in chapter 4) are aligned to the subtle realist position (228). The research was conducted in settings that were familiar to participants; relied on a combination of qualitative and quantitative methods to elicit participants' ways of knowing; focused on collection of contextual data; provided opportunities for production of emergent knowledge (as opposed to testing an *a priori* hypotheses); and used an interpretive and inductive approach to analyses of the data. These strategies enabled me (as the researcher) to (1) conduct research activities *with* the people whose behaviours (and the environment in which the behaviours are performed) were the focus of the research; and (2) adopt a dual perspective – objective *and* subjective – of the phenomenon that was the focus of the investigation: implementation of guideline recommended practices.

2.2 Methodological framework: intervention development

Interventions designed to change clinical practice behaviour and improve the uptake of evidence-based practices are invariably complex as they usually require an integrated set of actions and processes to address specific barriers and thereby facilitate change in behaviours of individuals and groups of people at multiple levels: the healthcare practitioner, service user, provider organisation and the healthcare system (234). The development of complex interventions is an iterative process but requires a systematic approach. The MRC framework for the development phase of complex interventions describes three non-linear elements (implying that the elements are iterative): identifying the evidence base, identifying/developing theory, and modelling process and outcomes (219). These elements were used as an overarching framework to guide the development of the intervention. Essentially, the MRC recommends using the best available evidence (existing evidence may be supplemented by new primary research if necessary) and appropriate theory (to understand the likely pathway(s) of change and how change is to be achieved) for intervention development. It emphasises the importance of refining the design of the

intervention before considering a feasibility and/or pilot study of the intervention to assess if it can be delivered in the local setting. Enhancements to the development phase of the MRC framework have been proposed by some researchers (235), to offer more clarity and guidance to intervention developers, as shown in Figure 2.2, below.

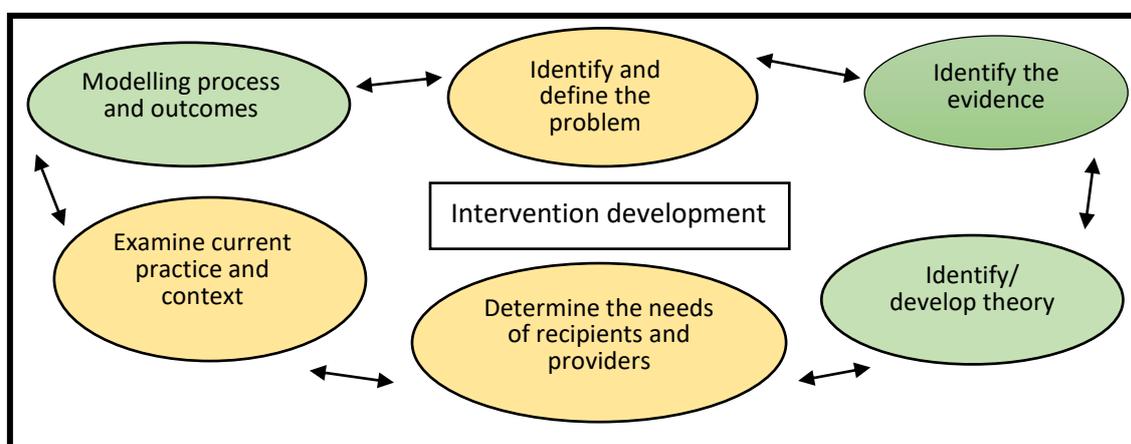


Figure 2.2 Expanded version of MRC development phase of a complex intervention.

[The circles shaded green represent the elements in the MRC framework; the yellow shaded circles are the additional elements; the bidirectional arrows between the elements denote the iterative, non-linear nature of the development process]

The MRC framework provides little detail on specific methods to deliver the key elements of the development phase when designing a complex intervention. The selection of the methods and the systematic development of the intervention was therefore further guided by adapting the stepped approach outlined in the ‘Implementation Intervention’ development framework (233). This framework has been iteratively adjusted and refined to serve as a practical guide for the systematic development of implementation interventions in diverse healthcare settings, including primary care (236). The four stages in this approach align with the MRC guidance; they are: (1) identify and define the ‘problem’; (2) use a theoretical framework to identify which barriers and enablers need to be addressed; (3) use the chosen theoretical framework to identify intervention content; and (4) identify outcome measures and assessment methods.

2.3 Research design

The development of an implementation intervention requires an understanding of the individuals who will encounter the intervention (stakeholders or intervention users), the context of the intervention (e.g., practice environment and organisational structures) and

the processes through which the stakeholders and the context interact with each other (237). Therefore, it was deemed appropriate to adopt a collaborative approach to intervention development (220), to facilitate stakeholder engagement (SE) and input. For the purposes of this research, a stakeholder was defined as any potential user of the intervention whose behaviour needed to be changed. Collaborative approaches in which stakeholders are involved in the research process also have the potential to generate feelings of a degree of “ownership” of the product amongst the recipients of the intervention. Recent years have seen an increased interest in stakeholder engagement in implementation science and intervention development research in the UK. The use of collaborative approaches between researchers and healthcare professionals has been successfully demonstrated in the designing of implementation interventions in hospital settings (238) as well as in primary care settings (239).

The stakeholders for this research were County Durham health visitors (HVs), who are the intended recipients of the intervention, and their supervisors/managers, who are likely to have a role in the delivery and evaluation of the intervention. Interventions developed through collaborative creative processes between researchers and stakeholders are regarded as more likely to be acceptable, engaging, and feasible to deliver, to maximise uptake and fidelity of delivery of the intervention, and to facilitate the process of translating research evidence into practice (240).

2.3.1 Stakeholders as research participants

Despite the emphasis on SE in the designing of behaviour change interventions, there is limited understanding about how best to engage with stakeholders in a meaningful and effective way (240). Stakeholders may be involved in the development of behavioural interventions either as research partners (referred to as patient and public involvement or PPI - in the UK) (241), or as research participants (242). In this study, HVs (as the stakeholder group) were involved as research participants. The extent/level of stakeholder engagement and approaches and methods used to engage with stakeholders vary widely between intervention developers (243). The goals and objectives for the collaboration and the level of engagement of HVs (as research participants) in this project were informed by the research objectives of this project, strategies used in collaborative approaches between researchers and stakeholders in implementation science research (240), and discussions with County

Durham health visiting teams at pre-workshop consultation meetings. These meetings were also useful for me to assess HVs' stage of willingness and capacity for research, and their ability to invest time to take part in the research.

2.3.2 Mode of engagement with stakeholders

An issue that was raised during the consultation meetings with HV teams and their managers was that HVs' time constraints and existing workload pressures could act as barriers to participation in the research. Hence, it was important to select a method of engagement that could maximise stakeholder input while minimising the time burden for them. The mode of SE used in this research is described in the literature as the 'informed design' mode (243). This mode is a commonly used mode of engagement with stakeholders to co-design interventions, frequently involving series of workshops. Although SE was used to generate ideas and aid decision making throughout the stages of the intervention, HVs' participation was mainly sought to seek their experiential (tacit) knowledge, such as their insights and views related to 'problem' identification, determination of practitioners' needs, and their views of the relevance, feasibility, and acceptability of the emerging design of the intervention in the local context.

A series of interactive workshops was held to engage with HVs, for the designing of the intervention. The decision to use workshops was appropriate for this research because (1) they can be effectively used to provide a platform for SE in collaborative research studies for the purpose of producing valid and reliable data (244); and (2) HVs' familiarity and comfort with interactive workshops. Drawing upon principles of co-creation and stakeholder engagement (244, 245), the workshop activities were informed by iterative processes of action and reflection, cycles of systematic investigation, and ongoing data gathering and analysis. Analysis was an iterative and emergent process. Each stage of the workshops resulted in output(s) to inform the design of the intervention; these outputs were used as inputs for the next stage of development. Although, the formal analysis of the data was researcher-led, participants performed a critical role in interpretation and verification of the data. This is elaborated in the subsequent paragraph.

2.3.3 Approach to data analysis

The data analysed from multiple sources (quantitative and qualitative) were triangulated to establish corroborating evidence and increase the credibility of the research findings. The

findings from the ongoing data analyses were presented at the workshops where activities were used for participants to review and confirm the findings. Where appropriate (as determined by the intervention development framework selected for this study), participants were asked to review the research findings and provide their insight into what the findings meant to them in the context of their practice. The objective was to develop a shared understanding of the analyses between research participants (stakeholders) and the researcher. Checking the veracity of preliminary analyses of results by engaging with participants and incorporating their feedback is recommended in mixed methods research with a subtle realism approach, to achieve methodological rigour and reliability of the data gathering and analyses processes (230).

2.4 Selection of the theoretical framework

Implementation of new clinical practices (and/or stopping or altering existing practices) is a form of behaviour change. Theories that explain why and how behaviours may change (i.e. identify modifiable predictors of behaviour) and what can facilitate behaviour change (i.e. explore potential causal mechanisms of change) are particularly useful in informing the content of implementation interventions (246). The MRC framework and implementation science literature (247) strongly advocate the use of theory in designing of behaviour change interventions. Although the evidence for the contribution of theory to intervention effectiveness is mixed (248), the use of appropriate theory can help overcome the limitations associated with development of interventions based on researchers' personal and potentially biased assumptions about what is likely to be effective (249). Complex interventions should be evaluated with regard to their acceptability, feasibility, compatibility with existing routines, stakeholders' perceptions of their usefulness, and their effectiveness in changing healthcare practices. Theory can help in analysing the effects of an implementation intervention: by informing decisions about what to measure (selection of appropriate outcomes) and assessing whether the targeted processes (e.g., recipient's attitudes, beliefs) in the intervention represent mediators of changes in behaviours (250).

The MRC framework does not provide guidance about selection and applying theory in designing of a complex intervention. The sheer abundance of available theoretical approaches can make it challenging to identify and select an appropriate theoretical basis, particularly for researchers from non-health psychology backgrounds (251). The literature

(252) recommends that selection of an appropriate theory/framework should be informed by consideration of the following key issues: (1) the overall goal of the research; (2) the population level (individual, group, organisation or system) at which the intervention is targeted; (3) effectiveness of existing approaches in the topic area of the research; (4) the nature of the data that will be available to use; (5) the stage(s) of the research process during which the theory, model or framework will be employed; and (6) the availability of resources for the researcher (in particular, their experience). Informed by this guidance and published literature on topics relevant to this research (existing evidence of factors that influence Health visitors' implementation of the recommended practices, effectiveness of strategies for improving implementation, methods for developing complex intervention), and following discussions with my supervisors, the Behaviour Change Wheel (BCW) was selected as the framework to guide the iterative process of developing the intervention (253). This was appropriate because the BCW provides a method to incorporate behaviour change theories into the intervention development process and complements the development phase of the MRC framework. The BCW has been widely used by researchers and practitioners to guide the development of interventions to support implementation of clinical guidelines by primary care practitioners (239, 254, 255). The systematic method for designing a behaviour change intervention using the BCW involves three broad stages which are further subdivided into several steps. Although the process is described in linear terms, the actual process may be iterative, involving going back and forth between the steps. The stages and component steps are:

Stage 1: Understand the behaviour.

- Define the problem in behavioural terms

- Select and specify the target behaviour(s)

- Identify what behavioural processes need to change

Stage 2: Identify intervention options

- Identify appropriate intervention functions

- Identify policy categories

Stage 3: Identify intervention content and implementation options.

- Identify behaviour change techniques (BCTs)

- Identify mode of delivery

The BCW is a theory- and evidence-based framework developed by synthesis of nineteen theoretical frameworks of behaviour change. At the centre of the BCW is the Capacity, Opportunity, Motivation-Behaviour (COM-B) model, an aggregated theoretical model of behaviour that aims to capture all possible factors that are known to influence behaviour change and are amenable to change (253). The COM-B model has been applied to identify factors that can explain healthcare providers' adherence or non-adherence to recommended practices (239, 256) and guide the development of implementation interventions (257, 258). The COM-B postulates that the interactions between an individual's capability (C), opportunity (O) and motivation (M) can provide explanations for why a behaviour (B) is or is not performed. Capability may be psychological (e.g., being able to engage in the necessary thought processes such as memory, comprehension, and inter-personal skills) and/or physical (e.g., stamina and physical skills) to engage in the specified behaviour. Opportunity refers to factors in the external environment that prompt or enable the performance of the behaviour and include both physical opportunity (e.g., time and resources) and social opportunity (e.g., interpersonal influences, social norms). By including the component 'opportunity', the COM-B model allows behaviour to be understood in context, which is key to designing and implementing potentially effective interventions.

Motivation is defined as all the brain processes that facilitate and direct the behaviour (as a priority over other competing behaviours). The 'motivation' component of COM-B is elaborated in the PRIME (plans, responses, impulses, motives, evaluations) theory of motivation which recognises that any behaviour can be influenced by both reflective thought processes (e.g., plans and evaluations) and automatic processes (e.g., habitual, impulsive, and affective processes such as emotions) (259). The PRIME theory proposes that the proximal cause of all behaviour is always the balance between all the processes that make up 'automatic' motivation (instincts, habits, wants or needs) and reflective motivation (conscious decisions based upon beliefs about what is beneficial or harmful, and right or wrong). The PRIME theory also recognises the importance of identity: the attitudes, values and beliefs held by the individual and shared with others within a professional group. The components of the COM-B model can be further elaborated using a more detailed tool, the Theoretical Domains Framework (TDF) (260), if more detail is needed to understand the behaviour. The TDF is a validated integrated theoretical framework made up of 14 domains that are considered as relevant for changing the behaviour of healthcare professionals.

Explicit links between the components of the COM-B model and the TDF domains are provided in the BCW guide (261). The BCW links the COM-B components to nine intervention functions (education, training, modelling, persuasion, enablement, incentivisation, environmental restructuring, restriction, coercion) and seven policy categories (legislation, regulation, guidelines, service provision, fiscal measures, environmental/social planning, communication/marketing) that can be used to support the delivery of the selected intervention functions. The intervention functions are linked to a taxonomy of 93 behaviour change techniques (BCTs) which are defined as “observable, replicable active ingredients” of an intervention, outlined in the BCT Taxonomy version 1 (262). The COM-B model-led behavioural analyses of practitioners’ behaviours guided the choice of intervention functions most likely to achieve behaviour change. Since the BCW was being used within the overarching MRC framework for this research, the stages, and steps of the BCW were mapped on to the three elements of the development phase of the MRC framework, to enhance clarity of the approach. The mapping of the BCW elements on to the elements of the development phase of the MRC framework and the four stages of the Implementation intervention development framework that was adapted for this research, as a practical guide for the development of the intervention (Figure 2.3).

MRC framework development phase elements (219)	BCW stages and the iterative steps (261)	The sequential approach used in this research to deliver the MRC guidance (adaptation of the Implementation intervention development framework) (233)
1. Identifying the evidence base	Define the problem in behavioural terms	Stage 1. Identify and define the problem (i) Identify and specify guideline recommended behaviours (ii) Identify the evidence base
	Select and specify the target behaviour(s)	
2. Identifying and/or develop theory	Identify what needs to change	Stage 2. Use theory (COM-B model) to identify which barriers and facilitators need to be addressed
	Identify appropriate intervention functions	
3. Modelling of processes and outcomes	Identify behaviour change techniques (BCTs)	Stage 3. Use selected theoretical framework to identify BCTs and mode of delivery; use evidence to select BCTs and mode(s) of delivery Stage 4. Determine parameters and methods to test feasibility of the intervention
	Determine the mode of delivery	

Figure 2.3. Mapping of the elements of the MRC guidance for the intervention development phase to the elements of the BCW and to the four stages of the Implementation intervention development framework.

2.5 The researcher's role

In the following sections, I have described two inter-related topics that are considered important to demonstrate best practice in mixed methods research: positionality and reflexivity (263). Positionality refers to the location (stance) I adopted in relation to the context of the research (subject of the research, participant group, and research process) (264). Reflexivity is the process by which I reflected critically on myself as the “human as the research instrument” (265). The literature on researcher positionality and reflexivity focusses on qualitative research, as the relationship between the researcher and the participants is typically more direct and intimate than in mixed methods research. However, researcher positionality and reflexivity are relevant topics where interactive workshops are used to collect quantitative and qualitative data from research participants (244).

2.5.1 Positionality

The interactive workshops used in this research to conduct research activities represented a shared space, shaped by both researcher and participants (244). It is likely that the social, cultural, and professional identities of both me (as the researcher) and workshop participants had the potential to impact the research process and the outcomes. Part of a researcher's positionality is also their own identity in terms of race, gender, sexuality, and ability (knowledge, skills) (266). It is reasonable to expect that my beliefs and biases, and social and cultural background (gender, ethnic origin, age) were potential influencers of the research process. At the start of this research, I considered how my personal (male, belonging to an ethnic minority group, coming into the PhD as a ‘mature’ student) and professional background (trained as a medical doctor, with experience in paediatrics), and skills and attributes that I have developed through diverse work experiences might influence my interactions with participants (and consequently, their interactions with me), and the collaborative research process. In the past, as a paediatrician, I have worked closely with nurses who have a role in preventive care. More recently, I had worked as a research assistant in research projects that investigated care practices of nurses and health visitors.

From my review of relevant literature, I understood that HVs enjoy a certain level of professional autonomy but that many HVs view the lack of support from doctors for their practice decisions as a barrier for them to implement guideline recommended practices. I was aware that the participants for this research were likely to be overwhelmingly female

and White; most recent data estimate that 89% of nurses and health visitors in England are female (267) and around 83% non-medical band 6 staff in the English NHS (HVs are in this category) are White (268). Throughout the study, to explore the issue of positionality, I documented my experiences of this research. Specifically, I considered these questions:

- How did I consider myself to be engaged in the research – what was my positionality?
- What role did my positionality play in exploring factors that influence HVs' practice behaviours?
- Did my positionality influence the interactions with research participants?

Reflecting upon these positionality-related questions and recording my responses required ongoing reflexivity which is described in the next section (269).

2.5.2 Researcher reflexivity

Reflexivity is considered as an important consideration in the conduct of mixed methods research, to establish credibility and methodological rigour of the research (263). In this study, participants were involved as knowing subjects who brought their perspectives into the knowledge-production process. Guided by the literature on collaborative research (270) and the use of interactive workshops as a research method (244), I identified several areas within the research process where researcher reflexivity was important. These were:

- Critically questioning my ways of doing the research; this involved focussing on my personal and theoretical assumptions, values, and experiences that shaped the research.
- Recognising and reflecting on my research decisions (such as methods of collecting and interpreting data) and consequently, recognising the limitations of the research.
- Reflecting on how participants' perceptions of my researcher identity may influence their interactions with the workshop activities
- Reflecting on the wider context in which the theme of this research and the research project were embedded, and how any changes in the wider context may influence the outcomes of this research.

I used self-reflective writing and mapping exercises as recommended in the literature as useful tools for researchers to practise reflexivity.

2.6 Demonstrating quality in mixed-methods research

The researcher's philosophical stance can influence the selection of research tools to

address quality in research and the manner in which they are applied to the research process (271). Validation strategies and processes have been proposed by proponents of the subtle realist approach to assess the different perspectives offered by qualitative and quantitative methods against each other and against criteria of quality that are common to both research methods (230). A number of strategies and processes were incorporated in the design and conduct of this research to address quality and rigour. These processes are recognised in the literature as important for addressing the quality of mixed methods research informed by subtle realism (230, 272). They were:

- Use of maximum variation purposive sampling, to capture a wide range of perspectives
- Clear, detailed description of methods used for data collection and analysis
- Use of critical reflection throughout the research process
- Triangulation of the results from different methods of data collection to develop/ corroborate an overall interpretation with the aim to ensure comprehensiveness
- Respondent validation: data checking and participant feedback during the research process (not just at the end)
- Use of an established method (e.g., the Framework method) for data analysis

The extent to which the research undertaken in this thesis demonstrated methodological rigour is discussed in section 6.8 (Researcher's reflections) in chapter six (Discussions), but also considered in other reflective parts of the Discussion chapter. The "Good Reporting of a Mixed Methods Study" (GRAMMS) checklist (271) was adapted to guide the reporting of the mixed methods research that was undertaken in this thesis. The completed checklist is included as an Appendix (appendix A).

2.7 Reflection on supervisors' professional background and research interests

There were several changes in my PhD supervisory team during the course of this research. The professional backgrounds and research interests of supervisors who supervised different stages of the research are, expectedly, unique. The favoured discipline and focus of research of supervisors can influence the selection of research aims, methods and the overall direction of a sponsored PhD research project (273, 274). Around the time of the first change of my supervisory team (involving the research site - Durham County Council), the focus of this PhD

research was changed – from developing a HV-led intervention targeted at parents to developing an intervention for HVs. This change – suggested by Gill O’Neill, Public Health Consultant and Deputy Director of Public Health, Durham County Council (DCC) – was regarded as relevant because professional development of staff working with 0-2 year olds and their parents was identified as a priority area for DCC (as part of their focus on best start in life and whole systems approach to obesity prevention). Karen McCabe from DCC who joined the supervisory team is a Public Health practitioner, and currently a Strategic Manager, Wellbeing & Partnerships in the department of Culture & Sport for the Council.

The research interests of the two main academic supervisors who supervised the early stages of this PhD (funding acquisition, formulation of overarching research goals and aims, development of methodology) are (1) nutrition and childhood obesity; and (2) maternal weight and reproductive health, respectively. My current main academic supervisors who have supervised all of the empirical work that I have carried out for the development of the intervention have research interests in complex intervention development and behaviour change. Professor Falko Sniehotta (Professor of Behavioural Medicine and Health Psychology) is a psychologist by background whose research aims at developing and evaluating behavioural interventions to improve health of individuals and populations. Professor Elaine McColl (Professor of Health Service Research) is a social scientist by background and her research interests include chronic disease management, clinical trials, public health, and primary care research. Both have experience in interventions targeted at obesity, with focus both on changing the behaviour of individuals with obesity and that of health professionals working with such individuals. The remaining member of my supervisory team is Professor Louisa Ells, Professor of Obesity, Centre for Applied Obesity Research at Leeds Beckett University. Professor Ells is a public health nutritionist whose research interests include multi-disciplinary applied obesity research with a focus on obesity related public health, systematic review evidence synthesis, service evaluation, coproduction, and patient-centred approaches.

Chapter 3. Systematic Review

The abstract of the Systematic Review was published in a special supplement of the journal *Obesity Reviews* (following the European and International Congress on Obesity) in 2020:

Ray D, Sniehotta F, McColl E, Ells L. Applying the COM-B model to understand childhood obesity prevention practices in primary health care: A systematic review. *Obesity Reviews Conference: European and International Congress on Obesity, ECOICO*. 2020;21(SUPPL 1).

This chapter presents the methods and findings of a mixed-methods systematic review (SR). This study (Study 1) was conducted to examine primary care practitioners' (PCPs) perceptions of the barriers to and facilitators of implementation of practices recommended for the prevention of obesity in 0-5 year old children.

3.0 Background

The opportunity for PCPs to promote healthy weight and prevent excess weight gain in children aged 0-5 years is highlighted by the World Health Organization (WHO) (91). Several national governments have developed and issued guidelines for the identification of 0-5 year old children at risk of obesity, and with strategies for prevention (275). In England, the National Institute for Health and Care Excellence (NICE) has developed several guidelines and recommendations for practitioners who work in primary care settings on maternal and child nutrition, and overweight and obesity prevention (5, 57, 140, 162). These guidelines are based on research evidence from a range of quantitative, qualitative, and economic analyses that are assessed for quality and then formulated into guidelines by a panel of experts for implementation by staff working in health and social care.

Implementation of guideline-recommended practices is influenced by a wide range of interacting factors which are related to the guideline, the healthcare setting, and the social, cultural, economic, ethical, and political context in which health practitioners work. These factors are collectively referred to as barriers and facilitators to change, or more broadly as "determinants of clinical behaviours" (276, 277). Survey studies, qualitative and mixed-methods research studies have identified factors at the organisational-level and individual-level that influence implementation of practices recommended for prevention and treatment of obesity in 0-5 year old children in primary care settings (278-280). It is important to synthesise the existing evidence related to practitioners' current practices and

their perceptions of factors that influence practice behaviours. This is required so that strategies and interventions can be developed to support practitioners' implementation of evidence-based practices, service development and future research into development of childhood obesity prevention interventions during early life. A search of databases failed to identify a recent or ongoing SR which has comprehensively explored this topic. This SR explored PCPs' practice behaviours and identified perceived barriers and facilitators to implementation of the guidelines recommended for the prevention of excess weight gain in 0-5 years old children.

The review was carried out as the first step in the process of designing a complex intervention to support health visitors' (HVs) role in addressing excess weight gain in 0-2 year old children. For the implementation of new practices and/or change in existing practices to occur, it is important to consider the behaviour change processes of interacting groups of people, including practitioners, parents and healthcare service managers (281). The Capability, Opportunity, Motivation, Behaviour (COM-B) model (described in detail in Chapter two of this thesis) was used in this review to develop a theoretical understanding of the factors that influence practitioners' practice behaviours and identify probable causal processes (Figure 3.1).

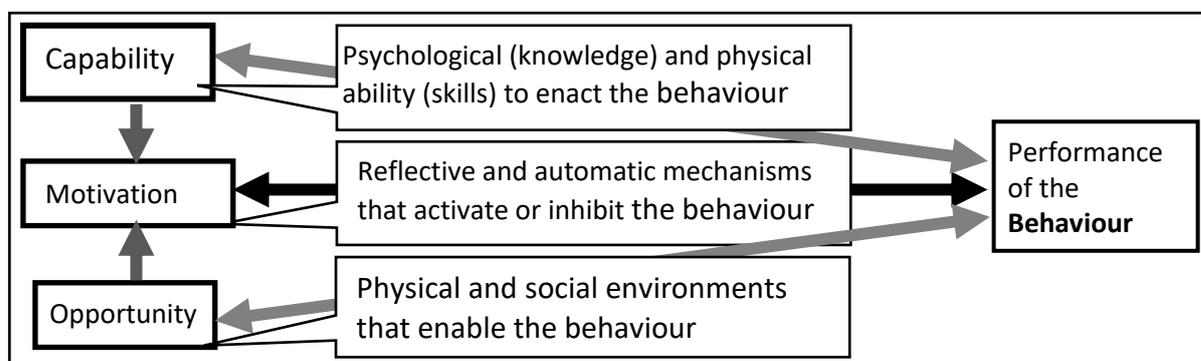


Figure 3.1 The Capability, Opportunity, Motivation, Behaviour (COM-B) model (253).

A behavioural analysis of the barriers and facilitators identified in the evidence synthesis was intended to help in identifying what needs to change to facilitate the implementation of the desired practice behaviours (or stop undesirable behaviours). The COM-B model lies at the centre of the Behaviour Change Wheel (BCW), a tool kit for designing behaviour change interventions and is the starting point of a theory-based intervention development. Mapping

the barriers and facilitators to the COM-B model will enable selection of relevant intervention strategies to address and overcome the barriers and enable the facilitators.

3.1 Aims and objectives

This SR addressed the following research questions: what is current practice in and what are the perceived barriers and facilitators for PCPs in implementing guidelines for the prevention of excess weight gain in children aged 0-5 years? The objectives were to synthesis the evidence on: (1) PCPs' current practice patterns, (2) identify barriers to, and facilitators of, recommended practices as perceived by PCPs, and (3) map these onto the COM-B model.

The decision to focus on a broader age group for the review (0-5 year) than the focus for the intervention (0-2 year) was taken following a scoping search of the literature. The scoping search revealed: (1) very few studies could be identified that addressed the research question exclusively for children aged 0-2 years; most studies focused on a broader age group of children (0-5 year and 0-18 year); (2) many studies that reported on care for 0-5 year olds and/or 0-18 year age groups also reported on data related to care for 0-2 year olds; (3) existing guidelines (e.g., those published by the WHO (282) and several national governments (275)) that provide recommendations for early interventions for prevention of childhood obesity apply to children aged 0-5 years old; currently, there are no national-level guidance for PCPs for identifying and managing risk of obesity exclusively in 0-2 year olds.

3.2 Methods

A mixed-methods SR, to include evidence from qualitative, quantitative and mixed-methods primary studies, was selected to account for the inherent complexity of the implementation of clinical practices in primary care. Mixed-methods SRs have the capacity to create a breadth and depth of understanding and therefore increase the strength and usefulness of the results and conclusions. The convergent integrated approach, according to the Joanna Briggs Institute (JBI) methodology for mixed-methods SR, was used to conduct this review (283). In this approach, the data from qualitative studies (including qualitative data from the mixed methods studies) and the data from quantitative studies (including quantitative data from the mixed methods studies) are synthesised simultaneously (convergent) and integrated through data transformation. This approach was deemed appropriate for this review because:

- All included studies could be grouped for synthesis by the nature of their findings (and not by their research design); further, the findings answered the same research questions, or addressed similar aspects of the target phenomenon.
- The findings of the quantitative, qualitative and mixed-methods studies were similar enough to be combined into a single synthesis; thus, the synthesis of data from individual studies (irrespective of their research design) could occur simultaneously.
- The nature of the quantitative data allowed its transformation into themes.
- The themes generated from quantitative studies could be directly assimilated with the themes generated from the synthesis of the qualitative data.

The review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) reporting guidelines (284). The PRISMA checklist is provided as an Appendix (Appendix B). The protocol was prospectively registered with the International Prospective Register of Systematic Reviews (CRD42017084067), and is available at: https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=84067 [updated 13 December 2019, last accessed 14 May 2021].

3.2.1 Eligibility criteria

The systematic review question determined the inclusion and exclusion criteria (listed in Table 3.1). Eligible studies were primary research studies (including qualitative, quantitative, and mixed methods studies) which reported on (1) childhood-obesity prevention practice behaviours of PCPs and/or (2) perceived barriers to and/or facilitators of PCPs' practices that are expressed as beliefs, attitudes, or understandings related to their practice behaviours. For the purposes of this review, PCPs were defined as health professionals who work in primary care and provide healthcare services including health promotion, disease prevention, health maintenance, patient education and counselling. They included doctors (e.g., general practitioners, family physicians, general paediatricians), nurses (e.g., practice nurse, child health nurse, health visitor, breastfeeding support nurse, paediatric nurse practitioner), community midwives, and community dietitians.

Table 3.1. Inclusion and exclusion criteria for selection of studies

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> • Sample (Population): Primary care practitioners • Phenomenon of interest (Intervention): Preventive care provided to children aged 0-5 years in primary care settings, for prevention of excess weight gain; studies that reported care involving a broader age group were included if the age range included 0-5 (for e.g., 0-18 or 2-18 year age group); studies reporting on breastfeeding support to mothers; studies that have looked into both prevention and treatment were included if data relevant to preventive care could be separated • Outcomes: <ul style="list-style-type: none"> - Research reporting on implementation/non-implementation of recommended practices - Research exploring behavioural determinants (for example, perceptions, attitudes, knowledge, self-efficacy) - Research reporting on barriers to and/or facilitators of implementation of practice • Research design: Quantitative (survey studies); Qualitative, Mixed methods • Search limits: English language studies from January 2002 onwards 	<ul style="list-style-type: none"> • Sample (Population): Non-healthcare professionals, parents, students, social workers, managers, project directors • Phenomenon of interest (Intervention) <ul style="list-style-type: none"> - Research focuses exclusively on treatment rather than prevention of childhood obesity - Studies set exclusively outside primary care (e.g., hospitals) - Preventive care exclusively for children >5 years of age • Outcomes Studies that reported on outcomes of an implementation intervention or quality improvement project • Research design: Studies that were not primary research (e.g., review, commentary, or opinion paper) • Search limits: Time period: papers published prior to January 2002 Not published in English

A barrier was defined as a factor that obstructed or hindered implementation of guideline-recommended practices; a facilitator was defined as a factor that supported or promoted implementation. A search of the literature revealed that guidance for UK health professionals for weight management in children in primary care was first published in January 2002 (285). An overview of national guidelines for the management of childhood obesity in primary care found that guidelines were published since 2003 (275). It was also in 2003 that the American Academy of Paediatrics published recommendations for prevention and early identification of obesity in children (286). In view of these findings and following discussions with my supervisors, I decided to conduct the search for eligible studies

published in peer reviewed literature from January 2002 onwards. I considered whether to limit the search to studies published only in English and the potential consequences of not including non-English language studies (287, 288). If non-English language studies are included in systematic synthesis of qualitative evidence, an important consideration is how to preserve the conceptual meanings of the emerging findings and map the themes when translating from different languages. I decided to limit the search to English language studies after considering the resources available to me (notably, time, costs for translation, access to networks), anticipated difficulties with retrieving full text non-English studies (due to dissemination bias of non-English research) (289), and my own lack of skills and experience with regard to dealing with non-English studies. No limit was set as to the country of origin of the study (e.g., non-English speaking countries).

3.2.2 Search strategy

The search strategy was iteratively designed with support from my supervisor (Professor Sniehotta) and a specialist librarian. The aim was to be as extensive as possible while also striking a balance between striving for comprehensiveness and maintaining relevance. As recommended by JBI, a three-step strategy was used, to identify eligible papers. Sets of search terms were developed relating to the practice context (primary care), health condition (prevention of childhood overweight and obesity), practice behaviours (working to guideline recommendations), phenomenon of interest (practice patterns, perceptions of barriers and facilitators, knowledge, attitudes, beliefs) and research designs.

An initial limited search of Medline and Google Scholar was undertaken to identify optimal search terms; this was followed by an analysis of the text words contained in the title and abstract, and of the key index/ subject terms used to describe the topics contained within the article. A second extensive search using all identified key words and index/ subject terms (subject headings) was then undertaken using five electronic databases (MEDLINE, EMBASE, CINAHL, PsycINFO, and British Nursing Index). To facilitate this, search terms were combined, along with thesaurus terms and truncation appropriate for the individual databases. More information about the search process and the full MEDLINE search strategy are presented in Appendix C. The third step of the search involved searching for any additional studies that may not have been identified by the electronic searches. Forward citation (by using the “cited by” function that is available in Google Scholar) and backward

citation (by checking the reference lists) of all the full text papers that were included for eligibility screening was carried out. In addition, the reference lists of published reports, opinion articles and reviews on prevention of childhood obesity in primary care, and literature on guidelines and evidence updates were also hand searched to identify any relevant articles.

Searches for eligible studies were originally conducted in March 2018. At the time of nearing the completion of writing up of my thesis (April 2021), three years had elapsed since the original search. The research question for this review is a topical one, with a growing body of knowledge regarding PCPs' role in management of childhood obesity. A scoping search suggested that there were new studies suitable for inclusion. Hence, it was important to update the review, to maintain its credibility and identify whether new research will affect the findings of the 'original' review (290). A new search for eligible studies published between April 2018 and 3rd week April 2021 was conducted to update the review, using the same inclusion and exclusion criteria and search strategy that was used for the original search.

3.2.3 Updating of the review

Following the selection of eligible studies for the review update, the procedures and methods that were used for the original review (described in detail in the sections below) were used for critical appraisal of the newly identified studies, and subsequently, for data extraction and data synthesis. Information about the studies that were included in the original review and the new studies included in the update are presented separately within the Results section (section 3.3) and in relevant appendices. The themes and sub-themes that emerged from the evidence synthesis from the studies included in the update confirmed the themes and subthemes identified from the studies included in the 'original' review. Hence, it was deemed appropriate to incorporate the evidence from the update within the larger body of evidence provided by the original review. Consequently, the narrative account of the thematic synthesis of the original review was updated. The findings of the updated review (representing the combined themes of the original review and the update) are presented in the subsequent sections.

3.2.4 Study screening and selection

All publications identified through searching the five databases were imported into EndNote

X7 where duplicates were removed. First, broad eligibility screening of titles and abstracts was undertaken by me as the first reviewer. The screening of abstracts was followed by full text screening of the manuscripts identified as potentially eligible for inclusion from the abstracts and titles screening. To minimise the risk of missing potentially relevant papers, I intentionally erred on the side of over-inclusion of abstracts and full text-during this stage of the screening; this is recommended by experts (291). This was particularly relevant for this research because the screening process revealed that the term “management” of childhood obesity was differently conceptualised by study authors. Most authors used the term “management” to refer to treatment of children who were overweight or obese (these studies were not eligible). However, some authors used the term ‘management’ to describe research which explored both primary preventive care *and* treatment of childhood obesity; these studies were included if data related to primary prevention care could be separated from data related to treatment. Where additional information was required, study authors were contacted by email (with a reminder after 2 weeks upon non-response). The rationale for exclusion of full text articles was documented and subsequently verified (those identified from the original search) by a Research Associate (Dr Mei Yee Tang) who has experience in conducting systematic reviews.

3.2.5 Critical appraisal of studies

The methodological quality of qualitative studies (and the qualitative component of the mixed methods studies) was assessed using JBI’s critical appraisal tool for qualitative studies (292). The appraisal tool recommended by JBI for prevalence studies was modified to assess the quality of the survey studies and the quantitative component of the mixed methods studies (293). The appraisal tools are included in Appendix D. I, as the first reviewer, assessed the quality of all the papers and a second reviewer verified the appraisal assessment on a random sample of 25% of the quantitative papers (Professor McColl) and 50% of the qualitative and mixed methods papers (Professor Sniehotta). Any disagreements on the quality ratings were resolved by discussion until consensus was reached. The assessment process was not used to exclude papers but as a guide to provide a context to interpret the findings.

3.2.6 Data extraction

Data on participants’ characteristics, practice setting, study design, aims, the phenomenon

of interest, and outcomes of relevance to the review question were extracted. Data extraction tools that are available from JBI were used. For quantitative data (survey studies), the tool for prevalence studies was used (294) and for qualitative data, the tool for qualitative studies was used (295). The quantitative and qualitative data from the mixed methods studies were separated and extracted using the appropriate tool. The data extraction tools are presented in Appendix E. Quantitative data comprised descriptive statistics and reports of results of tests for statistical significance. Qualitative data comprised themes or subthemes, as judged by the study author, with corresponding illustrations (participants' quotes).

Where the study included data that did not meet the eligibility criteria (e.g., parent data or data related exclusively to the treatment of obesity), only eligible data (namely data related to preventive care practices of practitioners) were extracted. A level of credibility (unequivocal, credible, or unsupported) was assigned to each reported finding, based upon any accompanying illustrations (participants' quotes or reference to a table/diagram). Data extraction was undertaken by me as the first reviewer and checked for completeness and accuracy by a second reviewer (Professor Ells) on a random sample of 25% of the papers. Any inaccuracies/discrepancies were discussed and resolved by consensus.

3.2.7 Data synthesis

The data synthesis followed the convergent integrated approach of the JBI methodology for SR (283). Following extraction, quantitative data (survey studies and quantitative data from mixed-methods studies) were transformed into qualitative findings. This involved a narrative interpretation of the quantitative findings into textual descriptions to directly address the review questions. Subsequently, the 'qualitised data' was assembled with the qualitative data extracted from qualitative studies (and the qualitative component of mixed-method studies). Thematic synthesis (an adaptation of thematic analysis, for the purpose of analysis of secondary data) was carried out on the assembled data using a coding frame that was developed iteratively. Findings that were sufficiently similar were grouped into categories, with at least two findings per category; two or more categories were grouped into a synthesised finding (theme). To guide the analysis of data relating to PCPs' practice implementation patterns, three sets of practice behaviour 'areas' were formulated, as shown in Figure 3.2, below.

<p style="text-align: center;">Behaviour area: Weight and growth assessment and communication</p> <p>Explain importance of weight monitoring; measure weight and height (length for 0-2-year-olds); assess and plot body mass index (BMI) and BMI percentile; discuss results with parents</p>
<p style="text-align: center;">Behaviour area: Assess infant feeding and other weight related behaviours</p> <p>Discuss with parents: breastfeeding; infant diet and nutrition; infant/ child feeding practices; physical activity, sleep, sedentary (screen time) behaviours; assess risk of rapid weight gain and of overweight/ obesity; assess motivation and readiness to change</p>
<p style="text-align: center;">Behaviour area: targeted prevention as appropriate</p> <p>Use recommended communication strategies and approaches to reinforce consistent, health promoting messages and education, guidance, and support for behaviour change; provide information about community programs, referrals to other practitioners (when appropriate)</p>

Figure 3.2. Practice behaviour areas formulated from guideline recommendations.

These ‘behaviour areas’ were based on the guideline recommended practice for HVs (previously described in Table 1.1, Chapter one) for the promotion of healthy, but not excess weight gain, in children aged 0-5 years. The emergent themes were analysed to understand their meanings and inter-relationships, to identify whether they were barriers to, or facilitators of, PCP’s practices. A narrative account of the thematic synthesis was prepared, and quotations were taken directly from the included studies to illustrate the themes. The second stage of the synthesis involved categorising the barriers and facilitators into the six sub-components of the COM-B model.

3.3 Results

Searches conducted in March 2018 of five electronic databases retrieved 4,701 citations of which 1,209 were duplicates. A further 3,261 citations were excluded based on screening titles and abstracts. Two abstracts that were assessed as eligible for full text screening could not be included: one study author confirmed that the research was not published as a full paper, and efforts to contact the author of the other study were not successful. Sixty-seven full text papers were screened; these included four papers that were identified through hand and citation searching. After screening of the full text papers, 45 papers (representing 45 separate studies) were included. The search process is illustrated in a PRISMA flow diagram(284) (Figure 3.3).

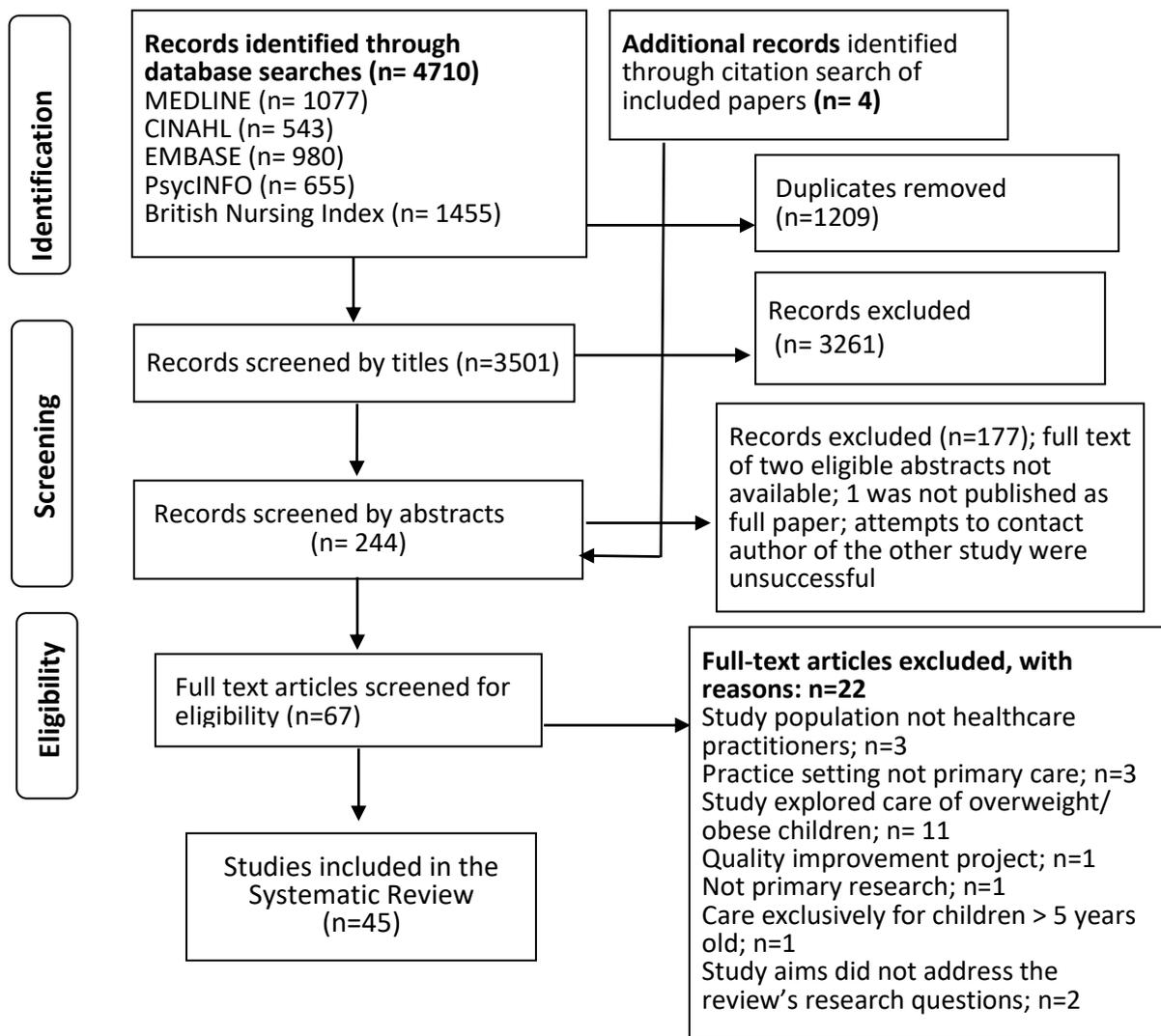


Figure 3.3. PRISMA flow diagram illustrating the study selection process conducted in March 2018.

Searches carried out in April 2021 (third week) for the update retrieved 1359 citations; of these, 215 were duplicates. Following screening of titles and abstracts, a further 1115 citations were removed. Thirteen full text papers were screened including one paper that was identified through citation searching. Five papers were identified as eligible for updating the review, following full text screening. The search process for the review update is shown below as a PRIMA flow diagram (284)(Figure 3.4). The most common reason for exclusion of the full text papers was that the study examined treatment of children with overweight/obesity and not prevention of overweight/obesity. Detailed information about the full text papers that were excluded including the reason(s) for exclusion is presented in Appendix F.

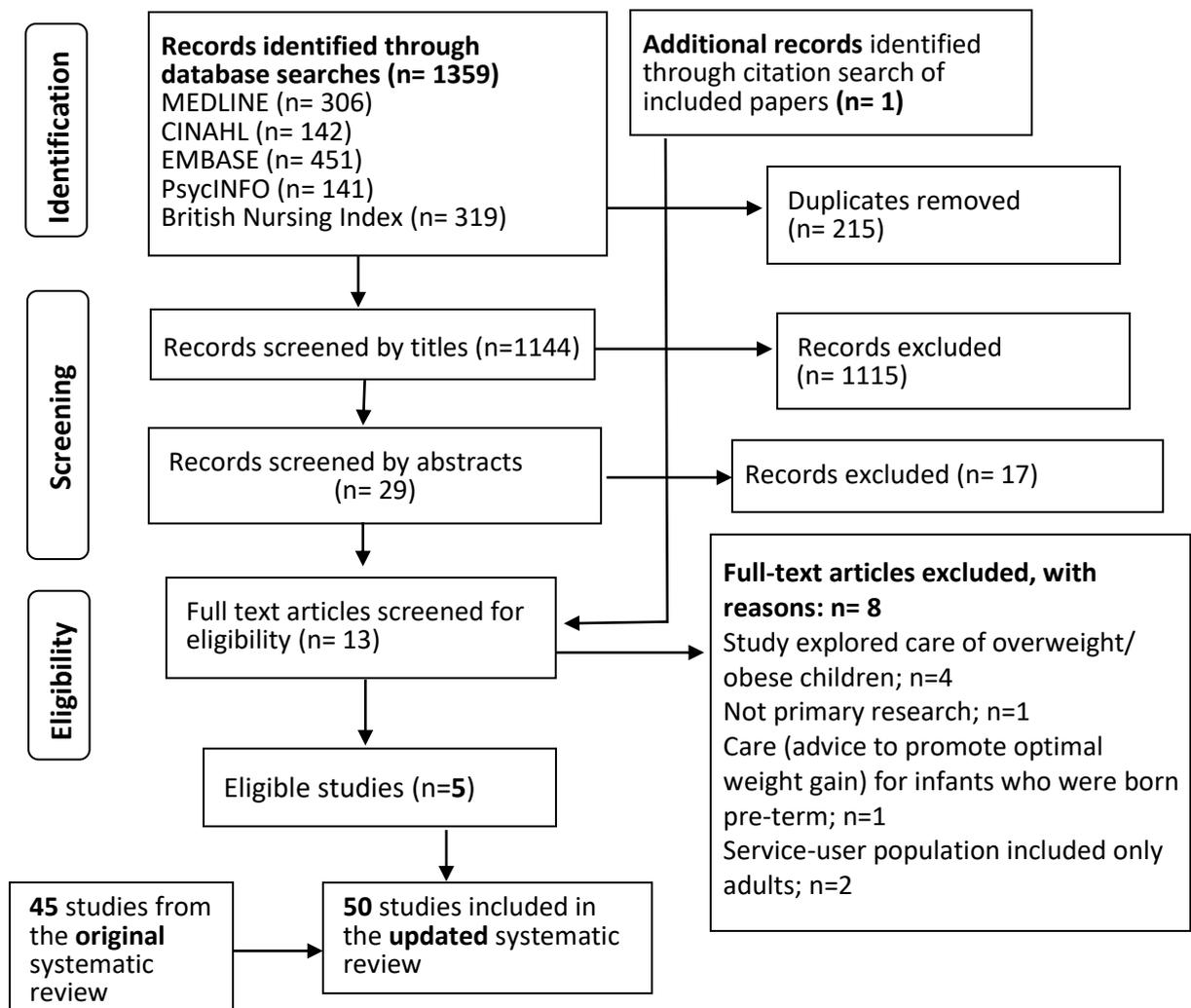


Figure 3.4 PRISMA flow diagram illustrating the updated search (conducted in April 2021); the updated search has been combined with that of the original search, to give the total number of studies included in the updated systematic review.

3.3.1 Characteristics of included studies

The characteristics of the 50 studies included in the updated review (including 45 identified in the original search and five additional studies identified in the review update) are described in detail in Appendix G. A summary of the study characteristics is presented below (Figure 3.5). Twenty-four studies were quantitative (all cross-sectional surveys); 21 were qualitative (interviews and focus groups); and five were mixed methods studies.

Description of the studies					
Number of studies	Quantitative(surveys)	Qualitative	Mixed methods		
Original search: 45	23	18	4		
Update: 5	1	3	1		
Grand total: 50	24	21	5		
Location of study and year of publication					
Country of origin	Number of studies		Year range	Number of studies	
	Original	Update			
United States	22	3	2017-2020 (update)	5	
United Kingdom (England)	8 (7)	-----	2011-2017	26	
Continental Europe	9	-----	2005-2010	14	
Australia	4	1	2002-2004	5	
Canada	2	-----			
New Zealand	----	1			
Participants group			Number of studies		Total (n=50)
			Original (n=45)	Update (n=5)	
Nursing profession (all nursing specialities, including public health nurses, domiciliary midwives)			14	2	16
Doctors (general practitioners, paediatricians)			12	1	13
Mixed samples (Doctors, nurses, dietitians, domiciliary midwives, breastfeeding counsellors)			19	2	21
Additional information about participants from Nursing profession					
Participants group			Number of studies		Total
			Original	Update	
Specialist public health nurses (HVs/ counterparts in other countries) as the sole participant group			10	2	12
Specialist public health nurses (HVs/ counterparts in other countries) as one participant group in mixed sample studies			9	2	11
English HVs (as one participant group in mixed sample studies)			6	----	6
English HVs as sole participant group			0	----	0
Outcomes		Number of studies that reported this outcome			
Practice patterns		31; of these, 26 also reported barriers and/or facilitators			
Barriers and facilitators		43			
Barriers only		19			

Figure 3.5 Summary of the characteristics of the studies included in the updated review

The country of origin of the papers were the USA (n=25), continental Europe (n= 9), the UK (n=8), Australia (n=5), Canada (n=2), and New Zealand (n=1). The majority (n=31) of the studies were published between 2011 and 2020 (five between 2018 and 2020). Fourteen studies were published between 2005 and 2010 and five between 2002 and 2004. Although no limits were set in the search strategy as to the location of the studies, all the included studies originated from developed countries that have in place national guidelines and

recommendations for PCPs' role in prevention of excess weight gain in children aged 0-5 years. Study participants were exclusively from the nursing profession (with different levels of specialist education and training and worked in different primary care settings) in 16 studies; in 13 studies, they were exclusively doctors (e.g., general practitioners, family physicians and paediatricians); and in the remaining 21 studies, the samples were mixed (e.g., doctors and nurses with different levels of training and speciality roles, community midwives, nutritionists, breastfeeding counsellors). Nurses with a specialist public health role (such as UK health visitors and their counterparts in other countries) were identified as the sole participant group in ten studies and as one participant group in nine studies that used mixed samples. English HVs were identified as one participant group in six studies that used mixed samples; there were no studies in which English HVs were the sole participant group. Of the eight studies that originated from the UK, only two studies explored PCPs' (they included HVs, GPs and practice nurses) role in prevention of overweight in infants and children; the focus of the remaining 6 studies was PCPs' role in supporting breastfeeding.

The measured outcomes in the survey studies and the phenomenon of interest in the qualitative studies varied across the studies but they all addressed different aspects of the review question. PCPs' self-reported practice patterns were reported in thirty-one studies. Barriers and /or facilitators were reported by 43 out of the 50 studies; of these, 25 studies also reported on PCPs' practice behaviours. The use of an existing psychological theory/theoretical framework was reported in only eight studies (five qualitative, two survey studies, and one mixed methods study); these were all published between 2011 and 2017. None of the five 'new' studies identified in the review update reported the use of theory. Four studies reported using models described in implementation science literature; these were the "model of determinants of innovation processes within healthcare" (296) (two studies), "implementation change model" (192), and Bacchi's account of policy analysis (297). Other reported theories were the theory of planned behaviour (two studies) (298) and social cognitive theory (two studies)(299).

3.3.2 Methodological quality of the studies

All studies were critically appraised and included in the review. Details of the assessment are provided in Appendix H. All the qualitative studies (and the qualitative component of the

mixed methods studies) had clear aims and findings, and used appropriate designs, sampling strategies, and methods for data collection and analysis. Majority of the studies (all five mixed methods studies and 19 out of the 21 qualitative studies) reported using procedures to enhance rigour of the study; these included purposive sampling, independent coding by multiple researchers, and group discussions to reach consensus. However, only six studies reported on the influence of the researcher(s) on the research (researcher reflexivity).

The majority of survey studies used restricted sampling frames (very few studies used national databases) and convenience (not random) sampling to recruit participants, thus limiting the potential for generalisability of the findings. Very few studies reported on sample size calculation. Most studies provided information on response rates (12 reported response rates >60%), used appropriate analytic methods and discussed potential biases. Almost all the survey studies acknowledged the potential for self-selection bias and self-reporting bias as methodological limitations. Studies that were rated lower in quality used non-validated instruments to measure outcomes (or included very little methodological detail, making it difficult or impossible to appraise the instrument), did not provide information about piloting, did not provide information about non-respondents, and did not discuss potential biases.

3.4 Findings of the review

Three broad themes emerged from the thematic analysis. The themes were identified as:

- PCPs' practice implementation behaviours
- Barriers to implementation
- Facilitators of implementation

The thematic analysis did not identify any patterns to suggest any significant difference in perspectives between the type of PCP and the country in which the study was carried out. No new themes or subthemes were identified in the updating of the review, i.e., by adding the five additional papers (published between 2019 and 2021). Barriers and facilitators were identified at the level of the PCP, family, and organisation (healthcare system). An overview of the barriers and facilitators with additional illustrative quotes is presented in Appendix I.

The three themes are discussed in the following sections with illustrative quotes and participant identifiers.

3.4.1 PCPs' practice implementation behaviours

Weight assessment

Twenty-one studies reported on weight assessment practices. PCPs considered visual inspection of the child as an important cue for identifying weight status of the child (280, 300-304). PCPs reported they used growth charts to measure height and weight (but not to calculate the BMI) either 'always' or 'most of the time' (280, 300, 302, 303, 305-310). The reported use of BMI ranged from as low as 11% (311) to as high as 96% (312) across different healthcare providers. The findings of one study from USA (312) which analysed results from three national cross-sectional surveys across 2006, 2010 and 2017 suggested that nationwide, there is an upward trend in paediatricians' assessment of BMI (and weight-for-length for children under 2) at every well-child visit from 2006 to 2017.

Although the BMI chart was regarded as a helpful tool to facilitate conversations about weight (280, 300, 313-315), the routine use of BMI for 2-5 year-olds (and weight-for-length charts for children under 2) was low, with roughly a third of PCPs never using BMI (188, 280, 302-304, 307, 311, 316-320) or using it selectively, for example, if visual inspection and results from the height and weight chart made them feel concerned (300, 304, 320). Low use of BMI was associated with PCPs' lack of knowledge of BMI guidelines, lack of agreement with using BMI (or weight-for-length) for assessment of weight status in children under age 2 years, lack of skills and confidence to calculate BMI and explain the findings to parents (188, 280, 300-303, 306, 309, 310, 316, 321-324), and perceived lack of time (302-304, 320, 324, 325).

"I wonder if BMI is a good tool and if what we are telling people is helpful, especially if we are less experienced." (Nurse, New Zealand) (324)

"No, I haven't calculated BMI, partly because I don't master it well – the BMI in children – and partly because I don't know the threshold values. Certainly, I could have looked it up but then I don't feel comfortable about informing the parents" (Child Health Centre nurse, Sweden) (301)

Many PCPs who reported they regularly measured BMI were not aware of the guideline recommended cut-off thresholds for classification of overweight (303, 306, 309, 316, 321). Some PCPs questioned the validity and predictive potential of BMI in children (188, 280, 300, 301, 322, 324).

"I don't look at them (growth or BMI charts) all that much because it doesn't take into effect their race, the parents' size or anything like that"
(Maternal and Child Health nurse, Australia) (280).

PCPs who used paper charts described this approach as inconvenient because it required additional steps to calculate and interpret BMI (300, 320). Explaining the findings of the BMI assessment to parents who lacked familiarity with BMI charts was described as complex and time consuming (302, 304). Role-specific specialist training, obesity training, familiarity with BMI guidelines and the belief that prevention efforts will produce positive outcomes were reported by studies (188, 302, 303, 312, 324) as facilitators of BMI use. BMI use was also reportedly high in primary care settings where PCPs were mandated to record BMI as part of the routine check-up (324), had access to tools and electronic medical record systems (which enabled automatic calculation and plotting of BMI percentile values) and support staff for screening (302, 303, 306, 312).

Breastfeeding support

The studies included in the review provided limited data on PCPs' breastfeeding support practice behaviours. There was variation in the extent to which recommended practices were implemented; for example, many PCPs did not routinely discuss and provide breastfeeding advice during antenatal and postnatal visits, or assist mothers with specific breastfeeding problems (326, 327). Although most PCPs believed that supporting breastfeeding was an important part of their role (280, 326-329), only a minority reported having observed a new mother breastfeeding (a guideline recommendation) and many had never counselled mothers about infant feeding methods, assisted mothers with breastfeeding techniques, or managed lactation problems (327, 329).

Many PCPs felt inadequately prepared and lacked knowledge and confidence to support the needs of breastfeeding mothers (327, 329-332). PCPs reported that they had little or no formal breastfeeding education and training, and the main source of their breastfeeding knowledge and confidence derived from their personal breastfeeding experience (327, 329, 333). Some PCPs considered breastfeeding as difficult and 'exhausting' and believed that bottle feeding was perceived as an easier option by some mothers (65, 310, 328).

“A lot of mums just don’t realise the reality of having a new-born baby. I mean, it’s exhausting and it’s no wonder they chose what appears to be the easiest method. Unfortunately, formula does seem to settle babies more quickly even though that’s not necessarily good for them” (Midwife, England) (65)

PCPs who promoted breastfeeding stressed the importance of supporting women with their “choice” and not being perceived by mothers and their own peers as being coercive or “breastfeeding zealots” (332, 333).

“Ultimately you’ve got to support the woman in her decision, whatever she wants to do and I think that’s very important.” (Breastfeeding counsellor, England) (333)

PCPs believed their influence in promoting breastfeeding is limited due to several factors that act as barriers for mothers to breastfeed (65, 310, 328, 333); these were described as maternal or infant frustration with the process of breastfeeding, mothers’ lack of knowledge and confidence in breastfeeding, previous negative breastfeeding experiences, traditional beliefs and practices surrounding breastfeeding, lack of timely support from healthcare services, and lack of support from family members and peers.

“But there’s always someone telling them if they’re having difficulties, ‘oh, look, you can just put the baby on the bottle’.” (PCP, Australia)

Providing anticipatory guidance on weight related topics

There was wide variation in the manner and extent to which PCPs discussed weight related topics with parents, as recommended by guidelines. For example, in one study, roughly 80 % of PCPs reported that they routinely assessed and counselled children/parents on lifestyle behaviours during most or all visits (334) while in another study, around 75% of PCPs reported that they did *not* discuss healthy eating behaviours at or prior to the child’s 12-month visit (335). One study from the USA reported - based on data from nationwide cross-sectional periodic surveys – that compared with 2006, paediatricians in 2017 were significantly more likely to discuss healthy diet and screen time behaviours with families (312).

Infant/toddler weight was viewed as a sensitive topic. PCPs found it difficult to raise the topic of weight due to personal discomfort (280, 300, 305, 310, 321-323, 325, 336, 337), fear

of offending parents (188, 308, 313-316, 320, 325, 334, 338) and previous experience of negative reactions from parents (anger, denial, helplessness and tearfulness) (280, 300, 310, 314, 324, 339).

“One mother stated very clearly that “I find it so hard to come to you because you always bring this up.” She got up and left; the father remained. I sat silent for a while, then I said: “I feel really sad that it has become like this, because my mission here is to help the children...” (Nurse, Child Health Centre, Sweden) (300)

PCPs less frequently discussed healthy eating and physical activity with parents of infants (0-2 year-olds) and pre-school children (2-5 year-olds) as compared to school age children (5 years and older) (280, 305, 308, 309, 313, 317, 321, 322, 335, 338, 340).

“To be honest I haven’t looked specifically at targeting that age group (0-2 year olds)” (GP, England) (308)

The frequency of counselling also varied depending upon the topic (280, 309, 312, 318, 319, 335, 339, 341); overall, diet and eating behaviours were more frequently discussed than other behaviours that PCPs identified as important risk factors for childhood obesity such as fast food consumption, physical activity, television viewing, parenting styles, and parent and child motivation to change. PCPs’ counselling about healthy weight mainly involved providing parents with advice about nutrition (280, 300, 308, 313, 316, 320, 322, 334).

“Diet is what we talk most about at CHC...from the first to the last encounter, with every family.” (Child Health Care Nurse, Sweden) (322)

However, the focus of such advice was generally about the contents of a healthy infant diet and less about infant feeding practices that are associated with risk of excess weight gain (280, 320). Further, PCPs tended to provide “blanket” nutritional advice and not discuss specific diet and nutrition topics; also, they were more likely to discuss fruit and vegetable consumption than consumption of sugar-sweetened beverages, fast foods, and energy dense foods (310, 316, 318, 334-336, 341).

“I think [Clinicians] are starting to talk about sugar-sweetened beverages...but probably not everyone” (PCP, Canada) (336)

PCPs lacked awareness of the importance of promoting physical activity in very young children (280, 309, 321, 335, 338, 339) and placed low priority on raising the topic (280, 310, 342). Children’s screen time behaviours were also infrequently discussed by PCPs during routine well-child visits (280, 302, 309, 323, 334, 335, 342, 343).

3.4.2 Barriers to implementation

The barriers were categorised at the level of the PCP, parent, and organisation (healthcare system). An overview of the key barriers is presented as a diagram below (Figure 3.6).

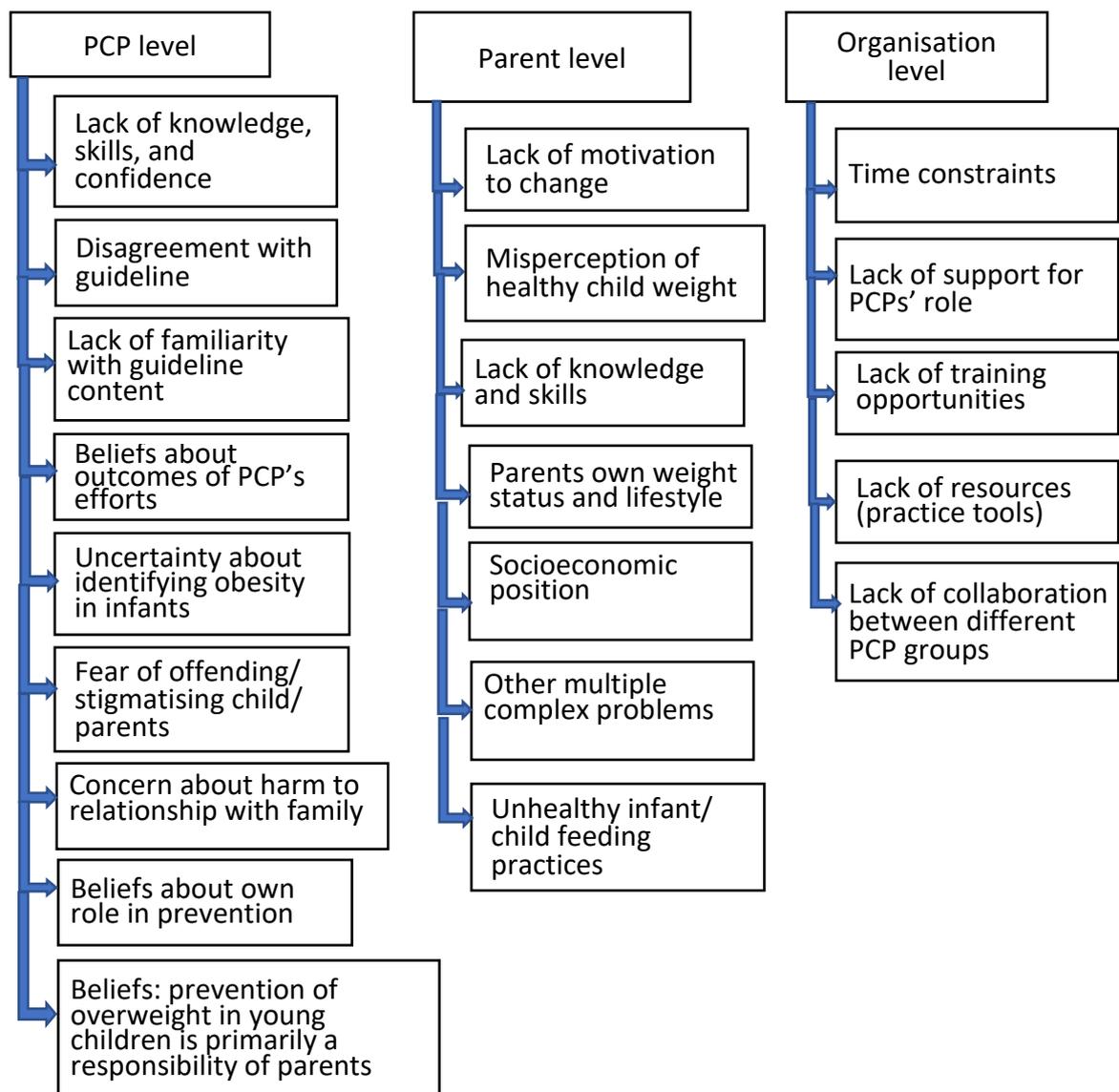


Figure 3.6. Diagrammatic representation of the key barriers (n=21).

Practitioner level barriers

Lack of knowledge

Lack of knowledge of the guidance on breastfeeding and management of common breastfeeding problems such as engorged breasts or mastitis was reported by all PCP groups (327, 329-332). Importantly, many doctors (GPs and paediatricians) admitted they lacked competence in key areas of breastfeeding management (e.g., prescribing to breastfeeding mothers; when and how to intervene if a baby is not gaining adequate weight) where other practitioners (e.g., nurses and midwives) may rely on them for advice or regard them as an expert for specialist referral.

"The simple things need to be understood, the more you do the more you realise you do not know. (I) feel it is outrageous and scary that paediatricians do not get specific training in breastfeeding. You assume health visitors know more so you have to look to them." (Paediatrician, England) (332)

Some PCPs relied on information they had gained anecdotally from colleagues or through their personal breastfeeding experiences to provide breastfeeding advice (327, 329, 332, 333). There was concern that such an approach could lead to PCPs offering advice that ran counter to recommendations and result in mothers receiving conflicting and incorrect messages regarding infant feeding (328, 330-333).

"I had all these awful emotions that women have when breastfeeding doesn't work, so...I feel I can support women with that, but that's because of using my own experience and putting it into a professional context. But I could see how easily someone could say 'well, I had to give up' and it can go the other way" (HV, England) (333)

Deficits in PCPs' knowledge of definitions of overweight and obesity and BMI guidelines (301, 303, 306, 309, 316, 321, 325), risk factors for excess weight gain in infants (280, 301, 308, 313) and guideline recommendations for diet, physical activity and screen time for children (301-303, 309, 313, 321, 337, 343, 344) were identified.

"The risk factors? I'm not very sure I suppose having recently watched that programme on the television the other week, I'd have to say that they're now saying that if...the mothers been very obese when the baby's born you know the mother has a history of obesity, apparently then the babies are much more likely to have similar issues." (HV, England) (308)

PCPs who lacked awareness of the importance of early interventions and overweight prevention protocols were likely to report low levels of confidence (280, 313, 321) and adherence with recommended practices (301, 309, 321, 337, 344).

Lack of skills

PCPs reported lack of skills to engage with parents to discuss weight and provide advice about weight related topics (280, 301, 305, 313, 321, 323, 337, 344).

“That [counselling about increasing physical activity and decreasing sedentary activity] doesn’t seem as overwhelming to me as counselling about diet does.” (Physician, USA) (337)

All PCP groups, including those who frequently encountered breastfeeding women, expressed that they lacked skills to adequately support the needs of breastfeeding mothers (327-332). Compared to midwives and nurses, doctors were more likely to report a lack of practical skills, such as demonstrating to mothers the positioning of an infant to the breast, assisting the baby to latch, and teaching mothers how to use a breast pump.

Lack of confidence

PCPs expressed lack of confidence in sensitively raising the topic of weight and engaging with parents for discussions on infant and child feeding practices (280, 308, 310, 313, 314, 317, 321-323, 334, 339, 344).

“...It’s something about not just informing or giving knowledge but how do you actually do it in ways that people will then integrate it?” (Maternal and Child Health Nurse, Australia) (280)

PCPs reported they found it more difficult (lacked confidence) to raise weight related topics with parents who were overweight (305, 309, 314, 321, 344) and with families who were experiencing other complex social and economic issues (313, 315, 323).

“I think an overweight parent might be a bit more defensive because they are already conscious of their own size, weight...and so it might be even more difficult, but I don’t know, I just think it’s difficult.” (Maternal and Child Health nurse, Australia) (314)

Disagreement with guideline content and/or evidence

Many PCPs were reluctant to identify 0-2-year-olds as being affected with overweight or obesity and were hesitant to discuss obesity prevention with parents of infants and toddlers (188, 280, 305, 308, 313, 315, 317, 322, 338, 340).

“[I’m challenged by] the lack of standardization of what defines ‘what is obesity’ in that age (0-2) because as far as I know there is not a standard definition.” (PCP, USA) (188)

Some PCPs believed that it was inappropriate to delay weaning for all infants until they are 6 months old (280, 308, 313) and unrealistic to advise parents to limit screen time exposure of young children (280, 343).

“Obviously parents know their children best, that’s what I say really, it’s just a guideline and that if you feel that they need food before then...there’s different signs that you can tell if they are needing that, then it’s fine as long as it’s not before 17 weeks really” (HV, England) (313)

PCPs viewed guidelines as advisory rather than prescriptive or mandatory, and justified their decisions with regard to deviating from the guidelines, to adopt a parent-centred approach (280, 301, 305, 308, 313, 323, 338). PCPs were also less likely to implement a specific guideline if they perceived the recommendation as ineffective or unrealistic (280, 320, 322, 323, 343) or restrictive of their professional autonomy (305, 345, 346).

Beliefs about outcomes

PCPs cited the role of obesogenic factors in the environment and expressed scepticism about the effectiveness of prevention interventions that are targeted at the individual level, and a feeling of helplessness about their ability to make a difference (188, 280, 302, 303, 306, 321, 334-336, 339, 343-346).

“The success rate of our intervention or our attempts at interventions on this particular topic is low. So, there’s a learned helplessness piece as well” (PCP, USA)(188)

“I think that physicians are always hesitant to bring up a problem if they don’t have the answer for it.” (PCP, Canada) (336)

Beliefs about role and responsibility

PCPs views about how prevention of childhood overweight fitted with their role and

responsibilities seemed to reflect their professional status, level of training, and their service delivery model. Although both doctors and nurses acknowledged that their role in promoting breastfeeding is important (65, 327-329, 333), not all doctors agreed that evaluation of breastfeeding was their responsibility. Nurses believed that providing advice to parents about healthy child weight was integral to the role of specially trained nurses (e.g., HVs) who work closely with mothers and infants (300, 308, 313, 321, 344),

"I don't really as a Practice Nurse deal with under ones as a dietary thing, it would be the Health Visitor" (Practice Nurse, England) (308)

However, HVs did not always see themselves as the experts (313, 338).

"Quite often my intervention would be to refer to the community nursery nurse for a further assessment and support programme" (HV, England) (313)

Doctors described their role in prevention as limited to only identification of overweight, with their priority being the management of children with overweight (308, 320, 346).

"I tend to recommend that the parents take the queries to the health visitor...because I think it is really important that we don't end up with conflicting advice..." (GP, England) (308)

Normalisation of 'mild' overweight

PCPs felt it was inappropriate to intervene if the child's weight had just crossed over into the overweight range (300, 313, 322, 323, 335); the belief was that, in the context of increasing prevalence of overweight in society, mild overweight was not an issue for concern for parents and PCPs.

"It is normal to be slightly overweight, really. We have changed our values somewhat. One didn't react quite as quickly before when children were chubby" (Child Health Centre nurse, Sweden) (300)

Beliefs about harm to relationship with family

PCPs considered infant weight, feeding practices and weight related behaviours as sensitive topics for parents, and felt that raising these topics may upset the parents and damage the practitioner-parent relationship (188, 308, 313-316, 320, 323, 334, 338).

"I think sometimes the provider may defer the conversation or touch on things lightly in an attempt to maintain rapport so they can continue to have an ongoing conversation in the future." (PCP, USA)(188)

PCPs were less likely to implement practices that required discussions on topics that they believed to have the potential to cause offence and evoke feelings of shame and embarrassment (e.g., infant feeding and food consumption behaviours) or elicit expressions of ridicule (e.g., TV viewing habits) (280, 300, 305, 322-325, 336, 337).

“Well, it has probably happened that, perhaps you have had to stop after you started, because some parents have firmly said ‘no, this is not possible’, and then you have to back out.” (Child Health Centre nurse, Sweden) (300)

Personal characteristics

PCPs’ own overweight status was reported as a barrier in two studies (335, 339); however, this was not reported as either a barrier or a facilitator in four other studies (316, 321, 340, 341). One study reported that PCPs who spent more time watching television (TV) were less likely to discuss TV viewing with parents of 0-2-year-olds (343).

Parent/child level barriers

Parental practices and beliefs

Parental practices and beliefs were identified as important risk factors for excess weight gain in pre-school children; these included unhealthy infant feeding practices (280, 300, 305, 308-310, 313, 315, 319, 322, 335, 337, 338) and parental misperceptions of healthy child weight (280, 310, 313-315, 324, 338).

“Milk is the biggest sticking point in my caseload extra milk, loads and loads of milk...the parents have this perception that children should drink lots of milk.” (HV, England) (313)

“I think it [a chubby baby] is seen as opposite of frail and thin and vulnerable, like hearty, chunky is better...And I think it’s also seen as well taken care of.” (PCP, USA) (338)

PCPs linked these risk factors to parents’ lack of knowledge and poor parenting skills (304, 310, 315, 316, 322, 325), lack of cooking skills (280, 300, 305, 313), parents’ own weight and lifestyle behaviours (305, 309, 316, 321, 344), influence of peers and grandparents (280, 308, 310, 325, 338), and cultural and social norms that influence parents’ perceptions of healthy infant weight (280, 300, 310, 313-315, 322, 324, 338, 339).

“Some mothers I think don’t like getting their baby into a routine and don’t like leaving them to cry or doing any of those sorts of things, and they will therefore feed their baby constantly rather than try to do controlled crying or anything like that.” (HV, England) (313)

The data suggests that PCPs viewed excess weight gain during early childhood as a matter of parental responsibility. PCPs cited socioeconomic and environmental factors as important risk factors but also emphasised the child/parent’s inability to control personal weight related behaviours (308, 310, 313, 315, 316, 319, 321-325, 337, 344). Some PCPs described parents as poor role models and apportioned blame on them (280, 301, 322, 338).

“...an adult causes their own overweight, but it is the parents of the small child who teach it the wrong eating habits. The child inherits the parents’ behavior” (Child Health Care nurse, Sweden) (301)

Lack of parental engagement

PCPs underplayed their own role in influencing parental practices and behaviours, and cited parental resistance and parental lack of concern/motivation to change as a major barrier (280, 300, 301, 305, 309, 310, 313-317, 319, 321, 322, 325, 334-336, 338, 339, 343-345).

“I find like half the parents don’t listen to the advice we give to them during those well-baby visits anyway.” (Clinician, USA) (336)

PCPs were hesitant to raise the topic of weight with families they perceived as less receptive, because of concern about provoking negative reactions and the risk of the parent disengaging from the service (188, 300, 310, 322, 324, 325, 336, 338).

“With my handouts, sometimes I’ll see them stuffed in the trashcan or blowing across the parking lot. It’s kind of disheartening at times” (PCP, USA) (325)

Parents with overweight and (assumed) unhealthy lifestyle behaviours were perceived as least likely to engage with PCPs and practices recommended for the promotion of healthy weight (305, 309, 310, 313, 315, 316, 321, 323, 344).

The largest risk is probably when obese parents do not consider overweight problematic. Many suppose that because of their own overweight, their children will also be overweight. These parents will not change their lifestyle.” (Nurse, Netherlands) (305)

Cost of preventive care

Insufficient reimbursement of the costs associated with providing preventive care for childhood overweight was identified as a barrier by PCPs who worked in privately funded healthcare systems in the USA (302, 316, 319, 334, 337). These PCPs reported that families who do not have insurance that covers obesity preventive care costs (most do not) are unlikely to access care because of concerns about cost.

“Too many people don’t have insurance...If you don’t have insurance, especially if your child is not sick, you are not going to come in for a well-child check. Even if they are overweight” (Nurse Practitioner, USA) (337)

Organisation level barriers

Time constraints

At the individual PCP level, time constraints were the most commonly reported barrier (65, 280, 301-305, 309, 310, 313, 315, 316, 321, 323, 328, 334-337, 343-346). PCPs explained that, during a typical visit, they had to address a range of issues (both parent- and practitioner-driven) which meant there was insufficient time to discuss sensitive weight related topics.

“Another question is whether there is enough consultation time. There are a lot of topics to which attention has to be paid during the consultation with parents. Time is a restrictive factor, but this also counts for more topics”. (Physician, Netherlands) (305)

Lack of role support

PCPs’ practice setting was an important influence in shaping their perceptions about capability. Implementation was hindered when PCPs perceived there was a lack of support for the PCP’s role, lack of strong leadership and inter-disciplinary cooperation, and where guidelines were not embedded at all levels of the organisation (65, 280, 301, 305, 321, 323, 330, 331, 344-346). The perception that organisational culture, structures and resources did not empower them and enable implementation, made PCPs feel discouraged; demotivated PCPs expressed concern about allocation of funding and resources to support the implementation of the guidelines and to address the increase in workload and time constraints (65, 345, 346).

“...In our opinion it’s necessary to increase the budget, making it possible for us to offer the families the good nursing they deserve. The topic is quite demanding, affecting feelings and interaction in the families, and we figured - status quo, we cannot do it.” (Public Health nurse, Norway) (345)

Two studies (one from USA and another from Norway) (337, 345) reported on experiences of PCPs who work in rural settings. These PCPs experienced implementation of guidelines as particularly demanding due to barriers related to infrastructure and rurality of the practice setting. These included having to work in areas where families were spread out across large distances, with few community resources and very limited access to support from specialists or community-based programmes to help families maintain a healthy weight.

Lack of training opportunities

All PCP groups reported the lack of training opportunities in breastfeeding support (327, 329-333), obesity prevention (301, 308, 310, 313, 334) and communication skills (280, 301, 302, 308, 313, 321, 334, 337, 344) as a barrier. In particular, physicians reported having received little formal training in breastfeeding education and clinical support skills.

“Like I mentioned I never had any training, but I’m giving advice, and I’m sure there’s lots of other people in the same position.” (GP, England) (308)

Further, access to training opportunities was hindered by staffing shortages, work pressures and competing priorities. When asked, PCPs identified various training needs (280, 301-303, 305, 308, 310, 326, 330-334, 337, 339, 344); topics included BMI monitoring in young children, breastfeeding support, communication and motivational skills, and supporting parents in promoting healthy eating behaviours, active play and limiting sedentary behaviour in young children.

Lack of resources

PCPs identified the lack of tools and materials including those for assessment (e.g., obesity risk, parental motivation to change) and support clinical decision making for practitioners (188, 280, 301, 313, 319, 321, 335, 336, 344), and educational materials for parents (280, 310, 319, 335, 344) as barriers to practice.

“I would have wished for...that a “package” would follow: tested, quality assured interventions with available external courses listed and so on. I

think that would have made the process so much easier..." (Public Health Nurse, Norway) (345)

PCPs who used only paper charts to record weight and height described them as inconvenient because they required additional steps to calculate and interpret BMI (300, 320). PCPs identified various resource needs; these included practice tools to enhance their capability and performance (188, 280, 302-304, 310, 334, 337, 339, 341, 344) (e.g., electronic health records with decision making support tools, automatic BMI calculators, BMI charts showing risk stratification and links to intervention strategies), and educational materials for parents (188, 280, 309, 310, 319, 339).

"So, I wish we actually had a red, yellow green traffic light growth chart to print out that actually had their growth pattern on it." (PCP, USA) (188)

PCPs also recommended provision of educational materials for staff (319, 328, 333, 339) and greater autonomy of the nurse's role (280, 315, 344).

Lack of a uniform, coherent approach

PCPs held the view that lack of clear care pathways and the decision by some individuals to not follow guidelines resulted in a practice environment where there was no uniform, coherent approach to preventive care (188, 301, 305, 308, 313, 315, 323, 324, 338, 346).

"If there were evidence-based guidelines for that child with excessive weight gain then this would be helpful so you could actually say 'research shows our guidelines are...'" (PCP, USA)(188)

PCPs believed that this resulted in a range of different approaches amongst different PCP groups that were not always based on evidence (280, 301, 308, 313, 323, 344).

"Actually, there is no cooperation with paediatricians and family doctors concerning the topic of overweight" (Physician, Netherlands) (305)

Nurses described feeling less confident after encountering doctors who did not take their referrals seriously or undermined the guideline-based advice they had given to parents (300, 313, 323).

"Sometimes...if you referred someone who is...over two centiles higher you tend to get from the paediatricians 'oh well why are you referring this child really', as a kind of 'I don't think this is too important'...I think we get mixed messages about what is obese" (HV, England) (313)

Gap in provision of preventive care

Organisational policies which resulted in gaps in care for breastfeeding mothers during the early postpartum period (328, 333) or which limited PCPs' contact with families of children (300, 336, 337, 346) were identified as barriers.

"... traditionally we see kids up to the two-year old because that's their last inoculation...So we don't actually see them until they go to school...there's that gap in their care...traditionally [in] family practice." (Physician, Canada) (336)

PCPs described limited opportunities for referral to specialist services (such as dieticians) and to community based obesity prevention programs as a barrier for families to achieve best possible outcomes (280, 301, 302, 313, 334, 335, 344, 346). PCPs recommended the provision of additional services to fill existing gaps in care (328, 337).

Lack of continuity of care

PCPs' emphasised that time pressures and staffing shortages increased the likelihood of the parent /family seeing a different practitioner during consecutive visits (lack of continuity of care). This prevented the development of positive practitioner-parent relationships and increased the possibility of the parent receiving potentially conflicting advice during contacts (280, 328, 333, 337).

"If you had someone whom you could see a couple of times in a row, then you could build up a rapport... 'I have had 5 different people tell me 5 different things and you're going to be another one.' I had one woman say that to me...and it is not always taken well" (Maternal and Child Health nurse, Australia) (328)

Lack of collaboration between different PCP groups

Lack of collaboration between physicians and nurses (301, 305, 308, 315, 338, 346) and lack of support from peers or superiors (301, 305, 321, 323, 332, 344, 345) were identified as barriers. In organisations where breastfeeding promotion was not seen as the norm, PCPs perceived lack of support for their breastfeeding support work from colleagues and mothers (332, 333). Nurses reported a lack of support from doctors in their clinical decisions as a barrier (300, 313, 315, 323), and emphasised the importance of feeling confident that the physicians will support them (300, 315, 346).

“It is really difficult and unfortunate for us because it would matter so much if the doctor did it. The doctor has a great power. And if the doctor said ‘It’s important that you’ll get some lifestyle conversations with the health visitor’, it would be SO much easier for us to get the message through to the family” (HV, Denmark) (346)

3.4.3 Facilitators of implementation

The facilitators were categorised at the level of the PCP, family, and organisation (healthcare system). An overview of the key facilitators is presented as a diagram (Figure 3.7).

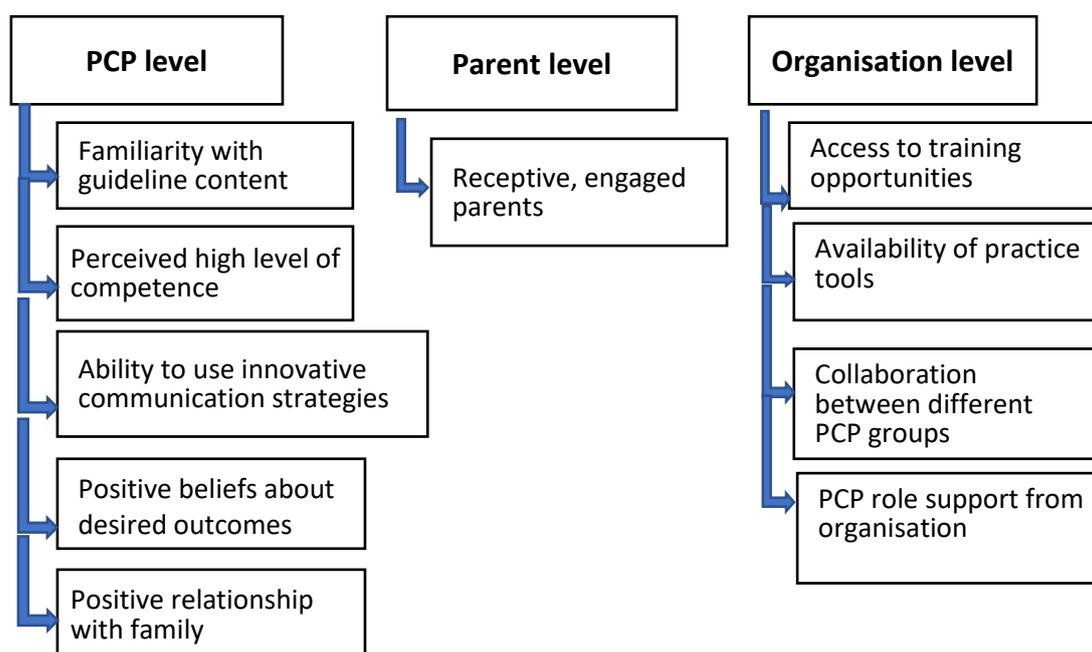


Figure 3.7 Diagrammatic representation of the key facilitators.

Practitioner level facilitators

Perceived high level of competence

PCPs who rated themselves as competent (confident and skilled) more frequently implemented guidelines (302, 303, 318, 341, 345) and were more likely to seek training updates (330, 331, 343).

“We didn’t know if this was a good way to do it...We wanted to make sure there was room to improve, and we wanted everyone to focus on the quality assurance this would lead to.” (Public Health nurse, Norway) (345)

PCPs’ high level of competence was attributed to role-specific specialist education and training (for example, paediatricians and paediatric nurse practitioners) (301, 304, 306, 307,

318, 319, 321, 329, 330, 334), participation in obesity training (302, 303, 341) and breastfeeding training (326, 329), familiarity with guideline content (302, 303) and greater experience of working with children and mothers (308, 310, 324, 330, 331).

“I've been doing this for a long time, so I just like to do ongoing education, keep up to date with the latest guidelines, with education on difficult things, you know, certain allergies and stuff like that.” (Child and Family Health nurse, Australia) (310)

Beliefs about role

PCPs who believed their role in prevention of childhood obesity is important reported positive attitudes and intention (300, 303, 309, 313, 320, 325, 327, 328, 333, 344, 345). Motivated PCPs described using approaches that facilitated implementation of practices; these included: using tactful language to discuss potentially sensitive topics, adopting a positive and holistic approach to discuss health and wellbeing rather than concentrating on weight, framing overweight as a societal issue, and utilising the BMI chart to raise the topic of weight, diet and feeding practices (280, 300, 301, 309, 313-315, 324, 325).

“Yes, first of all you want to do it in a respectful manner, because many of the parents feel they have failed when they see the percentile pointing in the wrong direction. Luckily, we've achieved a good dialogue and a good atmosphere with most of the families. But we've been thinking and reflecting a lot on which methods to use to motivate the parents, and also to explain.... I think these guidelines are so useful in that way...” (Public Health nurse, Norway) (345)

Beliefs about outcomes

PCPs' who reported high levels of self-efficacy (belief in the ability to successfully perform the practice behaviour) and expected positive outcomes (of their preventive efforts) were more likely to implement guidelines (302, 303, 312, 341).

Positive relationship between parent and PCP

Positive relationship between the practitioner and the family (280, 313, 314, 320, 336, 346) and parental concern about childhood overweight (300, 312) were identified as key facilitators. The view was that when parents themselves raised concerns about their child's weight, they were more likely to comply with PCP's recommendations.

“They embrace what you talk about, changing the diet and trying to assimilate the tips and advice that I have given...The easiest ones are the parents who say ‘help me’. They’re definitely the easiest.” (Child Health Centre nurse, Sweden) (300)

Personal characteristics

Several quantitative studies reported on associations between PCP’s gender and their knowledge, beliefs, and compliance with guidelines. Compared to their male counterparts, female PCPs (regardless of their job role and specialist education) were found to be more knowledgeable of guideline recommendations (329, 343), reported higher levels of self-efficacy and positive beliefs about effectiveness of their prevention efforts (341), and reported more compliance with guideline recommended behaviours (307, 340, 341, 343). These studies did not report on any reasons for the gender difference. One study reported that PCPs who engaged in regular physical activity more frequently provided weight related advice than those who were less physically active (316).

Organisation level facilitators

Organisational support for practitioner’s role

Perception of role support from the organisation (feel valued, availability of resources) (303, 334, 344, 345) and access to training opportunities (302, 303, 310, 319, 324, 333, 341, 343) were identified as important facilitators.

“The DGP [Division of General Practice] came through and gave us support to set HKC [Healthy Kids Check] up. We have a template from them...and also training at the Division so I’m fairly confident in what I’m doing” (Practice nurse, Australia) (344)

Availability of sufficient time and support staff (280, 302, 328, 337), access to specialist staff (dietitians, breastfeeding support staff) and local community based family-centred obesity prevention programs (280, 319, 341) were identified as potential facilitators. Some PCPs held the view that a uniform coherent approach to obesity prevention (300, 315, 345, 346) and closer working between physicians and nurses (300, 315, 324, 333) will improve the quality of care.

“And what we’re working hard on, everyone who works at the CHC, and those who work in the children’s team, is that we try to talk the same language, that we do not say different things, because it gives a sense of insecurity” (Child Health Centre nurse, Sweden) (300)

3.5 Theoretical analysis of the barriers and facilitators

3.5.1 Mapping of the barriers and facilitators on to the COM-B model.

Themes and subthemes representing the different barriers and facilitators were mapped to all subcomponents of the COM-B model except “physical capability”. It can be assumed that PCPs believed they have the physical strength and stamina to perform the behaviours. The mapping of the barriers and the facilitators at the level of the PCP, family, and the organisation to the COM-B subcomponents are shown in tables 3.2 and 3.3, respectively. While most themes and subthemes representing the barriers and facilitators could be allocated to a specific sub-component of the model, some themes could be categorised in more than one sub-component. For example, PCP’s beliefs and assumptions related to parental practices and attitudes can influence their motivation (reflective) to engage with parents and the social opportunity to perform the behaviours. Similarly, the emotions of shame, embarrassment, and fear (linked to stigma of childhood obesity) are categories under automatic motivation, but these are also relevant to the component of social opportunity, for practitioners and for parents.

3.5.2 Factors not mapped on to the COM-B model

A limited number of studies identified PCP-level socio-demographic factors that could not be mapped to a specific component of the COM-B model. A gender difference was reported in PCPs’ self-reported compliance with recommended practices (307, 340, 341, 343), knowledge about guidelines (329, 343), and beliefs about self-efficacy and outcome expectations (341). Other PCP-level factors that were reported to be associated with their practice implementation behaviours were PCP’s own weight status (two studies) (335, 339), physical activity behaviours (316) (316), and television viewing habits (one study) (343). One study (321) reported a direct relationship between PCP’s age and awareness of guidelines; this study also reported a direct relationship between PCP’s years in service and their perception of organisational support.

The reason for the gender difference in practice implementation patterns was unclear. The application of the COM-B model provided insights. Compared to their male colleagues, female PCPs were reported to be more knowledgeable of guidelines (psychological capability) (329, 343) and to hold high self-efficacy beliefs and beliefs about positive outcomes of their prevention efforts (reflective motivation) (341). There is some evidence in the literature (347) which suggests that, compared to their male colleagues, female providers spend more time developing relationships with patients (social opportunity) and have longer visits with patients (physical opportunity); this may explain to a partial extent why female PCPs are likely to more frequently counsel about weight related behaviours.

Table 3.2 Mapping of the barriers to the components of the COM-B model.

COM-B component	Practitioner level barriers	Parent level barriers	Organisation level barriers
Capability – physical	None were identified	Lack of cooking skills	None were identified
Capability- psychological	Limited knowledge of guideline content; use personal experiences as source of knowledge; limited knowledge of childhood obesity; lack of skills (including communication skills);	Lack of knowledge of risk factors and consequences of rapid infant weight gain; poor parenting skills; misperceptions (underestimation) of child’s overweight status	Lack/ limited provision of training; lack of tools (e.g., decision support); lack of clear care pathways
Opportunity -physical	Time constraints; competing priorities (e.g., acute illness, organisational priorities)	Parents’ socioeconomic situation (cost of implementing practices recommended for prevention of childhood obesity); time constraints (busy, working parents)	Lack of role support for PCPs: lack of practice tools and training; time constraints; gaps in provision of care;
Opportunity -social	Concern about harm to relationship with family; PCPs prioritise relationship with family over guideline adherence;	Stigma of overweight: parents do not engage/get offended; influence of grandparents and peers; social and cultural norms influence perceptions of healthy infant weight gain	Lack of continuity of care (prevents relationship building); lack of support from doctors of nurses’ decisions; lack of united, coherent care pathways for all PCP groups to follow
Motivation- Reflective	Lack belief in capability to successfully carry out the behaviours; lack of concern for overweight prevention in infants; ambivalence about own role in overweight prevention in infants; lack agreement with guideline content; low expectations of outcomes of PCPs’ own efforts; normalise mild overweight in 0-2 year olds	Parental resistance and lack of concern; parental lack of motivation to change; parents own overweight status and unhealthy lifestyles; parents’ views about official recommendations;	Belief that early childhood obesity prevention not a priority for the organisation
Motivation- Automatic	Stigma of overweight: PCPs experience discomfort (difficult to discuss); fear of being perceived as coercive/overzealous by peers	Stigma of overweight: negative reactions from parents (embarrassment, shame, denial); fear of parents disengaging from service	None were identified

Table 3.3 Mapping of the facilitators to the subcomponents of the COM-B model

COM-B component	Practitioner level	Parent level	Organisation level
Capability-physical	No facilitators at the level of the practitioner, parent or organisation level were identified in this review which could be mapped to this COM-B component		
Capability-psychological	Perceived high level of competence; Role-specific specialist education and training; good communications skills	None identified in this review	Obesity training; practice tools and materials (aid in communicating with parents)
Opportunity - physical	Ability to creatively use practice prompts and tools to engage with parents	None identified in this review	Provision of practice tools and materials (e.g., BMI calculators with risk stratification); staffing support
Opportunity-Social	Positive relationship with family; positive attitude and beliefs about importance of role	Receptive, engaged parents	United, coherent approach among different PCP groups; nurses perceive support from doctors of their evidence-based practices
Motivation-Reflective	Positive beliefs about ability to successfully complete the required behaviours; positive expectations of outcomes of PCPs' prevention efforts; motivated PCPs with positive attitude and beliefs about importance of role	None identified in this review	Support for PCPs' role (staffing and resources); more professional autonomy of the nurse's role

3.5.3 Analyses of the mapping of factors to the COM-B model

The findings of the theoretical analyses reflect the interactions between the subcomponents of the COM-B model, as hypothesised by the originators of the model. For example, PCPs who lacked knowledge and skills (psychological capability) and experienced (perceived) resistance from parents (social opportunity) reported lack of confidence in their ability to successfully perform the behaviours (e.g., raise the topic of weight) and low expectations of outcomes of their prevention efforts (reflective motivation). In contrast, PCPs who felt support for their role from the organisation (physical opportunity) felt more motivated (reflective motivation) to embed guideline recommended practices in their routines.

The findings also suggest that beliefs about capability and opportunity influenced the performance of the behaviour; for example, PCPs with access to time saving tools (physical opportunity) and those who had completed obesity training (psychological capability) more

frequently assessed BMI and counselled parents (behaviour). On the other hand, performance of the behaviour influenced beliefs about capability; for example, PCPs role required them to frequently provide infant feeding advice to parents reported higher levels of confidence in performing this task (psychological capability) than PCPs who had simply completed role-specific specialist training. Similarly, PCPs who successfully implemented innovative ways to communicate (e.g., use the BMI chart to raise the topic of weight) felt more able to engage with parents (social opportunity). The hypothesised inter-linkages between the subcomponents of the COM-B reflect the complexity of implementation of childhood obesity prevention practice behaviours.

3.6 Discussion

Building on previous work in this area (190, 348), this mixed-methods systematic review found that PCPs inconsistently address childhood obesity prevention in primary care, and experience numerous barriers to implementation. The updated review identified 50 studies published between 2002 and 2020. There was a high degree of consistency of the findings across the studies that originated from different countries, and between qualitative and survey methodologies. There were no significant differences between PCPs from different professions, with regard to the barriers and facilitators. The evidence synthesised from the additional five studies included in the review update did not generate new concepts or add depth to concepts that were already identified in the evidence synthesised from the findings of 45 eligible studies identified from searches carried out in March 2018. This suggests conceptual saturation of the information provided by existing sources of data in peer-reviewed English literature related to the research question of this review (349).

Although the focus of this review was preventive care specifically for children aged 0-5 years, several of the included papers covered care for children of a wider age range (2- 18 years). PCPs' practice implementation patterns varied, depending on the child's age. However, the themes relating to the barriers and facilitators were consistent across studies covering preventive care for children aged 0-5 years and those which assessed care for children aged 2-18 years. Some of the included studies covered care for breastfeeding mothers (and not children); inclusion of these studies was considered appropriate, to examine PCPs' breastfeeding support practices. Providing breastfeeding care and support is a key guideline recommended practice for all PCP groups involved in the care for 0-2 year olds because in

addition to providing optimal nutrition to infant and protection from obesity during later childhood, breastfeeding has benefits on both short and long term health of children and mothers (63).

Practice implementation differed in terms of PCPs' views about the importance of the practice behaviour and their beliefs about the time and skills required in delivering them. PCPs identified several barriers which influenced their capability, opportunity, and motivation to perform the behaviours; these were insufficient knowledge of childhood obesity prevention and lack of confidence in their communication skills, concerns about risk of harm to their relationship with parents, low expectations of outcomes of prevention efforts, time constraints, and parental lack of concern/motivation to change. However, when PCPs were specifically trained to address childhood obesity in their day-to-day practice, they were more likely to implement recommended practices. A trusting relationship between PCP and the parent was essential for PCPs to discuss weight related behaviours; whilst this potentially facilitated their practice, the value attached to maintaining the relationship acted as a barrier. The review also identified innovative communication strategies used by PCPs to overcome barriers, resource and training needs of PCPs, and PCPs' recommendations to improve the delivery and quality of services.

While most barriers and facilitators could be mapped on to the COM-B model, personal attributes and sociodemographic factors that were reported to be associated with PCPs' practice patterns could not be directly mapped on to a specific component of the COM-B model. This limitation of the COM-B model has been reported in the literature on barriers and enablers of adherence to recommended practices (350-352). However, the COM-B model can be used to understand the effects of the socio-demographic factors on behaviours where such evidence is available (350). The use of socio-ecological models in combination with the COM-B model has been recommended by some researchers (353), to map all determinants of behaviours that have a strong socio-cultural context.

The studies included in the review did not aim to determine the cause(s) of evidence-to-practice gaps nor did they describe the barriers as causes. Some studies reported associations between practice patterns and attributes of PCPs (such as their gender, professional role, rating of importance of barriers, length of professional experience, and beliefs about self-efficacy and outcomes). However, the included studies were all cross-

sectional, relied on self-reported data, and did not uniformly use measurement tools that had been tested for validity and reliability. Furthermore, it is important to acknowledge that the data related to barriers and facilitators are based upon the attributions that PCPs make about their own behaviours and may not be the actual determinants of their practice behaviours (193). The review's findings support the view that barriers are socially constructed by practitioners as a way of 'sense-making' to justify the situation they are in, and preserve their social and professional identity (354). PCPs attributed their own lack of skill and confidence to a lack of training, and identified many barriers external to them – namely, barriers at parent, organisation, and societal levels. PCPs' belief that parents and organisations are lacking in their efforts may have contributed to their sense of futility with regard to their expectations about the potential impact of obesity prevention efforts. Due to the potential of this attributional bias, caution must be exercised when interpreting the findings of the barriers and facilitators.

3.6.1 Gaps in literature

Several gaps emerged from the data. Firstly, there was lack of information about collaborative working between teams of PCPs from different disciplines. Much of the data presented in this review focusses on the individual PCP's practices and their attributes. Childhood obesity prevention in primary care is increasingly dependent on collaboration between individuals and teams from different disciplines. Such approaches are recommended by guideline developers and practitioners (189) and are likely to be more effective (355). Secondly, the lack of time was a frequently reported barrier; however, there was little data about how PCPs managed the full range of competing demands and priorities during interactions with their patients. Primary care encounters are typically time-constrained which requires PCPs to prioritise specific tasks, to maximise the benefits to the patient (356).

PCPs' implementation of guidelines may vary, depending upon how they (as individuals and as a representative of their group) interact and negotiate with the real-world contexts of their practice environment (357). Although some data on contextual influences (practice setting, family, and the wider socioeconomic and cultural environment) emerged from the synthesis, there was little data on the relative importance of different contextual factors and how these may have influenced each other and practice patterns. This may be due to the

research methods used in the included studies. The methodologies that are recommended to capture the complexity and dynamic nature of context, and its impact on implementation (for e.g., qualitative longitudinal case study design) are generally resource intensive (358).

3.6.2 Strengths of the review

To our knowledge, this is the first systematic review to systematically review and report on practice patterns of all key PCP groups who have a role in the prevention of childhood obesity *and* their perceived barriers to and facilitators of implementation of recommended practices. The use of an established mixed-methods systematic review methodology allowed a systematic and a rigorous thematic analysis and enabled a comprehensive understanding of the multiple level factors that influence PCP's practices. The design-specific appraisal tools that were used to assess the methodological quality of the included studies are widely used and are considered reliable and efficient (359, 360). Updating of the review in April 2021 by conducting systematic searches of the databases is a strength of this review and provided reassurance that there were no emerging issues.

This review has synthesised the evidence from fifty studies which were all conducted in developed nations but have different service delivery systems. The inclusion of studies of diverse research designs (quantitative, qualitative, and mixed methods) involving all key PCP groups and different organisational and social contexts ensures a rich and comprehensive dataset. The practice behaviours that were identified for this review used the guideline recommendations of NICE and Public Health England. These recommendations are quite similar to the guidelines published by the EPODE European network (361), the USA (362), and several other countries (where guidelines are available in English) (275) for management (including prevention) of overweight in 0-5-year-old children in primary care. Therefore, the barriers and facilitators identified in this review could be applied also to those countries.

The range of PCPs in the included studies represents the NICE guideline recommendations on "who should take action" which includes all healthcare professionals (irrespective of their professional role and identity) and other practitioners (such as nutritionists, breastfeeding counsellors). By combining the evidence regarding practice patterns of multiple PCP groups and their perspectives, the review has presented a broad range of perspectives and a comprehensive picture of the gaps in evidence-based practices.

The application of an aggregated theoretical model of behaviour (the COM-B model) has helped with developing a theoretical understanding of how the different barriers and facilitators relate to each other and influence PCP's motivation and performance of the recommended practice behaviours. The COM-B analysis has provided insight into what will need to be addressed to improve the implementation of recommended practices.

The findings of this review and the COM-B analysis of the multiple interacting influences on PCPs' practice behaviours will inform the designing of an intervention to strengthen HVs' role in preventing excessive weight gain in children aged 0-2 years.

3.6.3 Limitations of the review

Given the countries of origin of the included studies, the findings are likely to be relevant only to high-income countries although implementation may vary in these countries, impacted by different health care systems. Further, limiting to English language publications may have excluded relevant studies from countries with different cultural and socioeconomic profile that may have very different needs and experiences.

All studies that met the inclusion criteria were included irrespective of the assessment of their quality; this may have affected the quality of the data that was synthesised. Whether quality assessment can or should be used to exclude qualitative studies in systematic reviews remains a cause for ongoing debate. Excluding studies on the basis of reporting quality has the potential to affect the external validity of review findings (363). The data presented is subject to different sources of bias, notably selection bias and social desirability bias. For example, the majority of the qualitative studies did not describe the influence of the researcher on the research and most of the survey studies used non-random sampling methods and self-reporting data collection instruments that had not been tested for reliability and validity. Reviewers have highlighted the importance of improving the quality of reporting of primary qualitative research (364) and conducting research for the development of survey instruments that have strong theoretical basis and psychometric properties (365).

This review was 'restricted' because certain elements that are required in a full systematic review were simplified (366). The protocol was reviewed by my supervisors and then published on a prospective register. The process of study selection (screening of titles, abstract, and full texts) was completed by me as the first reviewer. In the role of a second

reviewer, my supervisors and one researcher (with experience in conducting systematic reviews) completed the following tasks: verification of my work on quality assessment on a random sample of the papers (50% of qualitative and mixed methods studies and 25% of survey studies); checking my work on data extraction on a random sample (25%) of the studies; and checking the full text articles that were excluded from the original search, to verify the rationale of my decision. Importantly, throughout the research, my work as the first reviewer was supervised and checked by my supervisors. The procedures that were followed in this review are considered as 'acceptable' minimum requirement for a restricted review by the Oxford Centre for Evidence-Based Medicine (366). A single reviewer screening of eligible studies may limit the methodological standard of a systematic review (367); however, studies have shown that the results from restricted systematic reviews that were carried out with only 20% checking by a second reviewer may be an appropriate strategy in situations where a 'full' systematic review process could not be implemented (368).

3.6.4 Implications for policy and practice

The review findings indicate that there are missed opportunities in primary care for addressing prevention of overweight in young children. All PCP groups expressed the need for training and resources (practice tools and materials), suggesting that PCPs believed that they should address the issue. At the level of the individual PCP, improving adherence to recommended practices will likely require a range of professional development activities focussed on building their knowledge, skills, attitudes, and self-efficacy, and also shifting their views about the importance and impact of early prevention interventions. In particular, developing motivational interviewing and counselling skills may help PCPs to manage parental resistance and enable them to work with parents as partners, as opposed to traditional didactic approaches. Changing professional values and practice norms of PCPs who have many years of experience may require a systematic and coordinated approach at the service/organisational level.

The findings also emphasise the importance of a supportive policy and practice environment for promotion of healthy child weight in primary care. Embedding early-childhood obesity prevention practices into PCPs' existing routines will require support for the practitioner's role, such as clear care pathways, decision support tools, and access to training and referral services. Implementation will likely require policies to support service delivery models that

focus on early intervention and prevention, promote a collaborative approach between different PCP groups, offer continuity of care and address case workload issues.

3.7 Conclusion and implications for future research

This review has highlighted the challenges associated with implementing practices recommended for prevention of excess weight gain in young children. Barriers and facilitators at the level of the PCP, parent, organisation, and the wider social environment were identified. Application of an integrated theoretical framework to the synthesis of the data has provided insights into the interacting processes by which practitioners' beliefs and personal values influence implementation. This review was the first step towards developing a theory-and evidence-based intervention to support practitioners who work in primary healthcare and have a role in prevention of excess weight gain in 0-2 year old children.

The review identified important gaps in the literature. Studies are required beyond identifying the barriers and facilitators; these will need a more explanatory and theory-driven approach to investigate how and why the barriers and facilitators influence implementation. Another important area for future research is exploration of how and why specific contextual factors influence implementation, their relative importance, and interactions between different contextual factors. The double burden of malnutrition (in which inadequate nutrition and excess weight gain co-exist) in pre-school children in low- and middle-income countries is an urgent public health concern (17). In 2017, the WHO published guidance and best practice recommendations for PCPs for assessing and managing children aged 0-5 years in primary care facilities, to prevent overweight in the context of the double burden of malnutrition (282). It is relevant to examine how these guidelines are being implemented across different healthcare systems and socioeconomic and cultural contexts.

Chapter 4. Development of the intervention.

4.0 Introduction

A complex intervention was developed for health visitors (HVs), with the aim to strengthen their role in prevention of overweight and obesity in 0-2 year old children. This chapter describes in detail the systematic process of integrating evidence, theory, and stakeholder engagement, to develop an intervention that is more likely to be acceptable to HVs and feasible to deliver in the local (County Durham) context. An overview of the approach, frameworks and methods that were used for the development of the intervention have been presented in chapter two. Intervention development was a dynamic iterative process, involving potential users of the intervention, and was informed by a systematic synthesis of published research evidence (reported in chapter three) and theoretical basis of behaviour change. Intervention-user involvement was a key component to tailor the content of the intervention to context. This is recommended in the Medical Research Council (MRC)'s framework for development of complex interventions (219) and published literature on development of implementation interventions (369). As elaborated upon in chapter two, the Behaviour Change Wheel (BCW) was chosen as the theoretical framework to guide the process as it provides an evidence-based approach for integrating behavioural theory to understand the target behaviours, identifying relevant intervention functions and specifying intervention content (218).

4.1 Glossary of terms

A glossary of terms and concepts used in this chapter is presented, informed by the BCW literature and literature on complex intervention development. The purpose of the glossary is to provide clarity and understanding.

- **Intervention:** a policy, programme, or action intended to bring about identifiable outcomes (218).
- **Co-design:** relevant stakeholders (e.g., users of the intervention) are involved in decision-making about the intervention through different stages of the development process (220).
- **Complex intervention:** an intervention containing multiple interacting components that are delivered as part of an intervention package (219).

- Intervention strategy: a plan describing how the selected intervention functions and BCTs could be delivered through selected policy categories in a specific context (218).
- Intervention function: a broad strategy within an intervention to bring about behaviour change (218).
- Intervention content: the contents of a complex intervention refer to the behaviour change techniques (the active ingredients) used within the intervention (218).
- Behaviour change technique (BCT): a BCT is proposed as a replicable, potentially “active ingredient” of an intervention which can enable behaviour change by altering or redirecting causal processes (e.g., beliefs) that regulate behaviour(262).
- Intervention components: BCTs are operationalised - translated from their taxonomic definitions into applications – for the purpose of delivering them within an intervention; the operationalised versions of the BCTs are the components of the intervention (370).
- Mode of delivery of the BCT: the method(s) by which intervention components are delivered to the recipient of the intervention. The selected mode of delivery (e.g., face-to-face, online or in written form) can influence the effectiveness of the BCT (262).
- Form of delivery: this includes all features through which the intervention is delivered including: the provider, mode of delivery, materials, intensity, tailoring and style (371).

4.2 Aim and objectives

The aim of this study was to design an intervention to strengthen HVs’ role in prevention in 0-2-year-old children in County Durham, England.

The specific objectives were to:

1. Identify and specify practice behaviours recommended by guidelines for HVs for the prevention of overweight in children aged 0-2 years.
2. Identify key modifiable barriers to and facilitators of the specified practice behaviours that are relevant in County Durham.
3. Identify intervention functions and content (BCTs).
4. Identify intervention components (the applications through which the BCTs will be delivered) and mode(s) of delivery that are likely to be feasible and acceptable.
5. Identify feasibility outcomes and research methods that are relevant and likely to be acceptable in the local context for a future feasibility study of the intervention.

4.3 Intervention development framework

The intervention was systematically developed in phases by drawing on the MRC framework for the development phase of complex interventions (219) and the step-by-step guidance provided in the BCW framework (218). To operationalise the elements of the development phase of the MRC framework, the four stepped approach outlined in the Theory Informed Implementation Intervention framework (233) was iteratively adjusted and refined to guide the development process. An overview of the different frameworks used in this research including how they align with each other and the links between component elements of those frameworks have been presented in chapter two.

The four phases in which the intervention was developed were as follows: (1) identify and define the 'issue'; (2) identify priority modifiable barriers and enablers that are relevant in the local context; (3) identify intervention components and mode(s) of delivery to overcome the barriers and enhance the enablers; and (4) identify outcome measures and methods to assess acceptability and feasibility of delivery of the intervention. The activities that were conducted in phase one (identify and define the issue) are reported in chapter three. This chapter describes the work that were completed during phases two, three, and four of the intervention development process. Each phase had specific objectives that were carried out sequentially and involved research activities that were carried out with workshop participants (to gather qualitative and quantitative data from participants) and concurrently, desk-based research activities (carried out by me). Findings/outcomes from one phase informed and acted as inputs for subsequent phases.

4.4 Methods

A collaborative approach was used to co-design the intervention with professional stakeholders. The consultative and collaborative work with stakeholders involved a series of interactive workshops. A total of 11 workshops were conducted, divided into four stages, to meet the objectives of the different phases (phases two, three and four) of the intervention development process. These phases and associated stakeholder engagement activities and desktop research activities are shown in Figure 4.1, below.

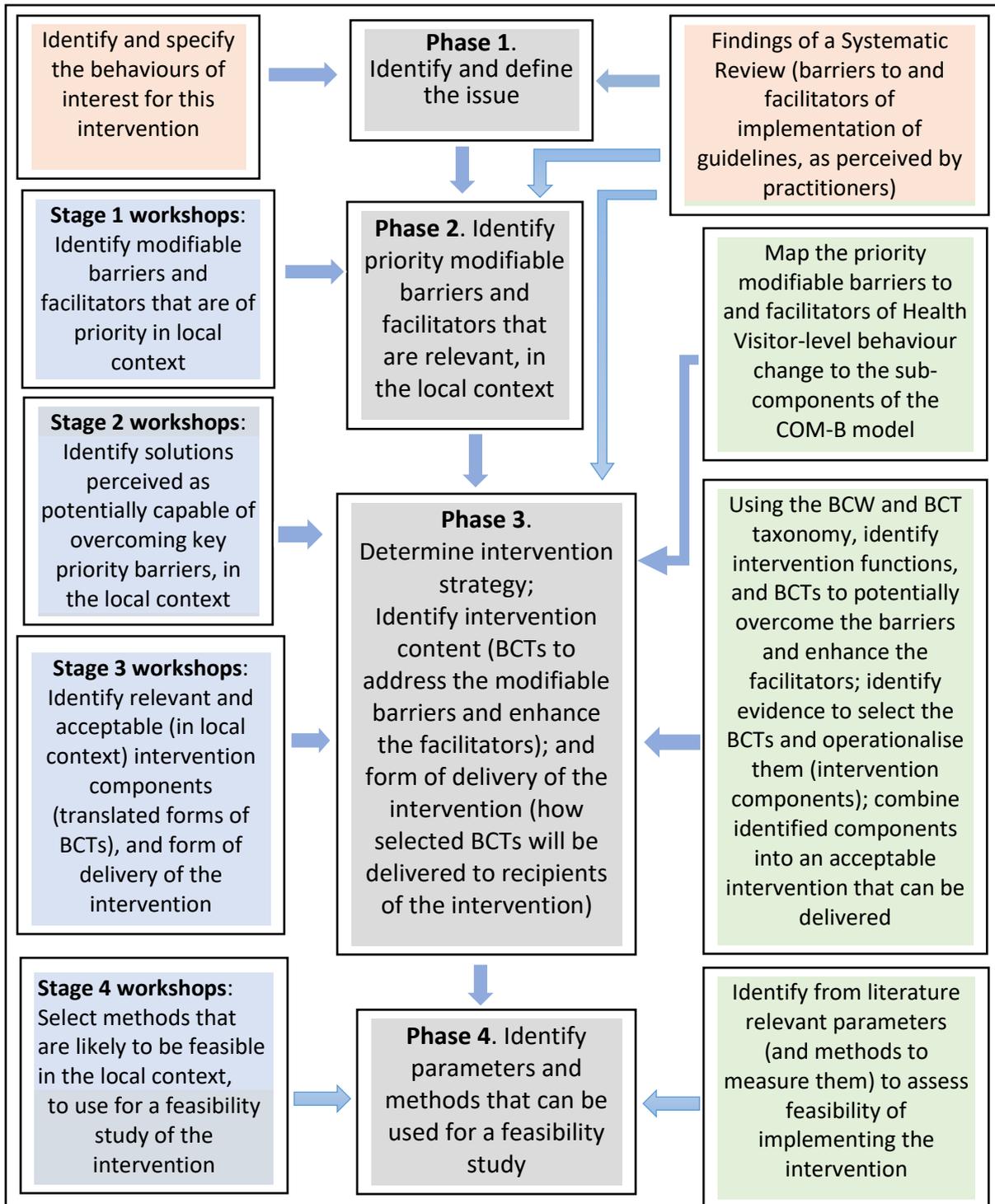


Figure 4.1. An overview of the development of the intervention. Boxes shaded grey represent the four phases of the Implementation Intervention Framework; boxes shaded pink represent activities that were undertaken prior to the activities described in this chapter; the boxes shaded blue represent the stages of the workshop with HVs; boxes shaded green represent desktop research activities; BCW= Behaviour Change Wheel; BCT= Behaviour change technique; COM-B= Capability, Opportunity, Motivation- Behaviour model

The professional stakeholders were County Durham health visitors (HVs) who are the intended recipients of the intervention, and their supervisors/managers who are likely to have a role in the delivery and evaluation of the intervention. HVs and their supervisors and managers were consulted from a very early stage to discuss the proposed research and its relevance, and feasibility of the planned participatory approach to designing the intervention. Both quantitative and qualitative methods were concurrently used to collect information from workshop participants on various processes of intervention development, such as assessing factors influencing implementation, developing intervention content, and assessing context (231).

Workshop participants were engaged in the ‘informed’ mode of co-design (243) where in a consultative role, they provided their insights and views of the contextual relevance, feasibility, and acceptability of the emerging intervention. As previously mentioned, and illustrated in Figure 4.1 above, the designing of the intervention involved four stages of interactive workshops conducted during different phases of the intervention development process: stage one workshops (phase two), stages two and three workshops (phase three), and stage four workshops (phase four). An interactive workshop has been defined as (372) ‘a structured set of facilitated activities for groups of participants who work together to explore a problem and its solutions, over a specific period of time, in one location’ (p.1). The stages of the workshops and their aims are illustrated in Figure 4.2, below.

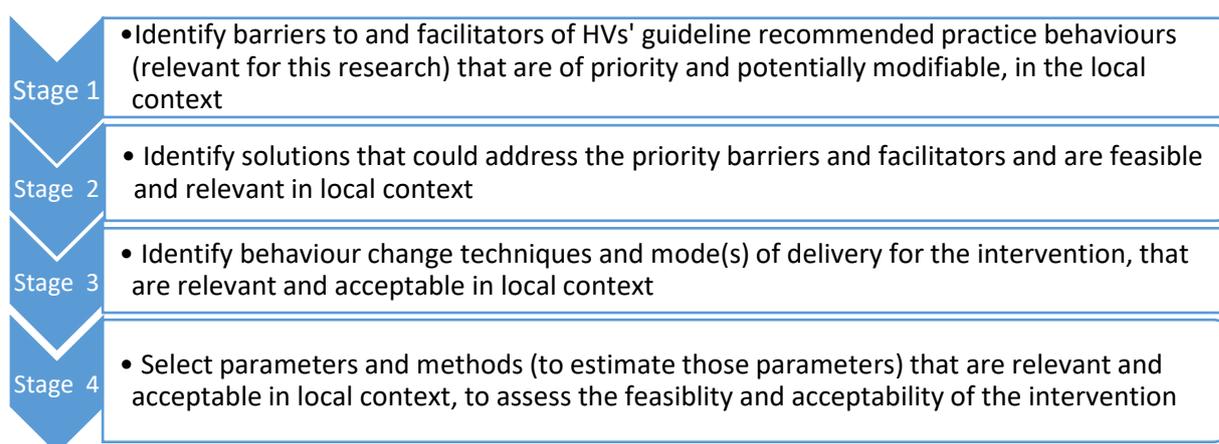


Figure 4.2. Stages of the workshops for the co-designing of the intervention.

An iterative process was followed which involved cycles of systematic investigation, sequential validation of the evidence and generation of ideas about the content, format, and

delivery of the intervention. Participants' experiences and their views of what is important and relevant in the local context and potential issues related to the practicality of delivering the intervention at the research site were elicited, to inform the design of a potentially feasible and acceptable intervention. To this end, the workshops were structured with clear aims and objectives to facilitate participants' engagement with different workshop activities and lead the discussions. After each stage, the output(s) from the workshops were collated, analysed, and critically reflected upon, and subsequently used as inputs to the next stage of development. Because of the iterative nature of this work, the development of the intervention is reported by phase by phase, including the objectives, methods, and findings relevant for that phase. Both quantitative and qualitative methods were used to collect data in the workshops themselves and in desk-based research between workshops.

4.4.1 Research site and participants

This research was developed through a partnership between Durham County Council (DCC) and Newcastle University following a decision by the Director of Public Health, DCC to develop an intervention for HVs, to strengthen their role in prevention of excess weight gain in 0-2-year-old children. A brief summary of profile information about County Durham, DCC's whole system approach to prevention of childhood obesity and the organisational context of this research is included in Chapter 1 (section 1.10).

During the conduct of this research, the Growing Healthy Team of Harrogate, and District NHS Foundation Trust (HDFT) delivered an integrated 0-19 Healthy Child Programme (HCP) (which encompasses the HV-led HCP 0-5 Service and the School Nurse led 5-19 HCP) in County Durham. Five location-based HV teams were identified who worked across different rural and urban areas of the County. In December 2018, there were a total of 128 HVs (corresponding to 106.6 whole time equivalent staff, due to some working part time) in post across the county, with the number of HVs per team ranging between 21 and 32.

Prior to seeking approvals for this project, I met with health visiting service managers and all five HV teams, to present an overview of the research project, including the anticipated role of HVs as end-users of the intervention. Initially, consideration was given to repeating all four stages of the workshops with each of the five HV teams. Time and resource constraints, and an expectation (based on the findings of the systematic review reported in Chapter 2) that barriers and facilitators would be similar across teams led to a decision to reduce the

number of workshops, while giving each team the opportunity to take part in at least two workshops at different stages of the design process (table 4.1, below). Purposive sampling of teams with respect to which team participated in which workshop was used to ensure representativeness of the views and experiences of the HVs who worked in different areas within the county. The number of participants in each workshop was determined by the size of the HV team which took part in that workshop.

Table 4.1. Participating HV teams in the four stages of the workshops

HV team	Area covered in County Durham	Number of HVs per team (estimate as of December 2018)		Stages of the workshops in which the team participated in
		# of HVs in post	% of HVs for County Durham	
Team A	Durham & Chester-Le Street	32	25%	Stages 1 and 3
Team B	Sedgefield	21	16.4%	Stages 1 and 4
Team C	Derwentside	21	16.4%	Stages 1, 2, 4
Team D	Seaham, and Peterlee	29	22.6%	Stages 2 and 3
Team E	Durham Dales	25	19.5%	Stages 3 and 4

4.4.2 Recruitment of participants

Approvals for this research were granted by Newcastle University Faculty of Medical Sciences ethics committee (13/12/2018), NHS Health Research Authority (12/2/2019), and Durham County Council (March 2019) (included in Appendix J). Research and Development approval was granted (22/2/2019) by Harrogate and District NHS Foundation Trust which employs the HVs who participated in this study. All eligible participants were provided with a participant information sheet explaining the research and the role of the researcher and workshop participants, including the nature of the activities of the workshops (see Appendix K). Participants had the right to decline to take part in the study/or a particular workshop and to withdraw at any time, without giving a reason. Participants consented to take part in the workshops and to audio recording of selected workshop activities.

4.4.3 Interactive workshops

Eleven workshops (three in Stage one, two in Stage two, three in Stage three, and three in Stage four – see Table 4.1) were conducted. The majority of the workshops lasted for 60 minutes (this was the time HVs were able to set aside for taking part in a particular

workshop); three workshops (one each in stages one, two and four) which had 20 or more participants took around 75 minutes to complete. The decision about the number of workshops conducted at each of the four stages was informed by the nature of data generated from each workshop. The workshops were held at venues where HVs hold routine monthly staff meetings and followed on immediately after those meetings. The scheduling of dates and time slots for the workshops ensured members of all the five HV teams had the opportunity to take part in a minimum of two workshops. The overall planning, facilitation and evaluation of the workshops were informed by values and design principles recommended for stakeholder engagement (SE) in research (244, 245, 270):

- Stakeholder engagement was embedded within the intervention development framework
- The objectives of stakeholder engagement were clearly explained to participants.
- The necessary resources required for SE were identified (researcher's skills and competence, support from co-facilitator, participants' time).
- Stakeholder engagement was initiated from the outset, to seek 'buy-in' and commitment from potential participants.
- A plan of SE activities was clearly outlined in the research protocol, including how input from participants would be gathered, analysed, and used.
- Participants' dual identity – as individual practitioners and also as a representative of their professional group - was considered whilst planning the research activities
- A balance was maintained between promoting participants' engagement and productivity and meeting the workshop's objectives in a timely fashion.
- At all workshops, findings from the earlier stage(s) of the development and where relevant, research findings of the previous workshops held during that stage were shared with participants.
- Participants' evaluation of the workshop (at the conclusion of each workshop) was sought, for my own learning and for valuing participants' contribution.

The planning and designing of workshop-specific activities was informed by the aims and objectives of that particular workshop and consideration of practical issues such as the time and resources available at the venue and expected number of participants. A range of activities was used to engage with participants and collect data. These included brainstorming (collaboratively expressing views and opinions on a topic to generate ideas);

group discussions (followed by feedback from a representative to present a summary of the group's ideas); affinity mapping (clustering of ideas into themes); post-it notes exercises (participants' written records of personal views); and 'sticky dot' voting (372). These are summarised in Table 4.2, below.

Table 4.2. Methods, techniques, and tools used for facilitation of the workshop

Workshop process	Activity	Strategy, tools, and techniques
Planning of the workshop	Develop agenda and objectives of the workshop	<ul style="list-style-type: none"> Consider participant sample size, time available, and physical space and equipment that is available
	Develop programme of activities (determined by the workshop agenda and objectives) and format of the workshop	<ul style="list-style-type: none"> Design different kinds of activities (individual and group based) Bring <i>everything</i> that will be needed to conduct the workshop (e.g., flip chart sheets, activity cards, fibre tip pens, sticky dots, post-it notes)
	Follow up invitation sent earlier to participants	<ul style="list-style-type: none"> Work collaboratively with person(s) who have direct access to participants' contact information
Conducting the workshop	Welcome and brief introductions	<ul style="list-style-type: none"> To do this task, consider who is more familiar and credible among the participants (could be the workshop co-facilitator)
	Explain ground rules (few, simple and basic)	<ul style="list-style-type: none"> Create an environment that is safe for everyone to participate and in which there are equal opportunities for them to do so
	Presentation of agenda and relevant information (e.g., evidence statements, summary of outputs of previous workshops)	<ul style="list-style-type: none"> Consider the amount of material that can be presented adequately and the amount that participants can absorb within the available time Use brief summaries (consider tables, bullet points, figures, graphs)
Facilitation (facilitator and co-facilitator working together)	Activity sheets (instruction to participants)	<ul style="list-style-type: none"> Organise printed material that is easy to read and digest (e.g., bullet points)
	Managing group dynamics	<ul style="list-style-type: none"> Group Dynamic Guide (373)
	Active listening	<ul style="list-style-type: none"> The Listening Ladder (373)
	Questioning	<ul style="list-style-type: none"> Appreciative Inquiry tool (373)
	Information gathering	<ul style="list-style-type: none"> Brain storming: use groups of 4-6 participants each (group dialogue takes place best in small groups) Use of Flip chart and post-it notes Affinity Diagram (cluster ideas into themes) Individual dot voting (tool to democratically prioritise and rank items, and make decisions or in a group setting; potential weaknesses: persuaded voting and group voting)
Evaluation of workshop	Collect feedback from participants immediately after the workshop	Design an evaluation form that is context specific and can be filled out quickly but covers the areas that the researcher really wants to know

Voting by sticky dots is an established democratic process to elicit individual participants' views on the importance of ideas and concepts that require prioritisation (374). This method is particularly useful for assessing participants' opinions to further explore a topic, choosing amongst several potential ideas, ranking topics, and narrowing down options. As the workshop facilitator, I encouraged participants to engage and contribute, provided guidance, direction, and context, actively listened to participants' views, and maintained sensitivity to all verbal and non-verbal communications (244, 245, 270). An experienced specialist public health nurse was the co-facilitator and observer of all the workshop sessions. I kept a reflective journal (to document ideas, observations, and thoughts) and regularly discussed my observations with the co-facilitator. An overview of the stages of the workshops, their aims, activities and key outputs, and related post-workshop activities is presented in Table 4.3 (following page). A selection of photographs taken at the workshops are presented below (Figure 4.3).



Figure 4.3 Co-design workshops

Table 4.3. An overview of the plan of the different stages of the workshops (aims, activities and outputs) and post-workshop activities that were undertaken for the co-designing of the intervention; [Abbreviations: WS= workshop; SR= systematic review; BCT= behaviour change technique]

Workshop stages	Workshop (WS) activities	Key outputs	Post workshop activities
Stage 1 Aim: Identify priority and potentially modifiable barriers and facilitators	WS 1 and 2 <ul style="list-style-type: none"> Spontaneously identify barriers and facilitators of practices that are relevant in the local context Assess relevance in the local context of 20 barriers and 10 facilitators that I identified as key findings in a recently completed SR 	<ul style="list-style-type: none"> List of locally relevant barriers and facilitators mentioned spontaneously by participants List of SR-identified barriers and facilitators, identified as locally relevant 	<ul style="list-style-type: none"> Identify barriers that were common to the SR and participants, barriers unique to the SR, and barriers unique to participants Identify 20 key barriers from the analyses: <i>this list was used as an input for Stage 1 WS 3</i>
	WS 3 <ul style="list-style-type: none"> Rating of 20 key barriers in terms of their importance and changeability in the local context Identify training and resource needs (potential facilitators) 	<ul style="list-style-type: none"> Barriers rated for their importance and changeability in the local context Contextually relevant training and resource needs 	<ul style="list-style-type: none"> Priority ranking of key barriers: used as an input for the next stage (stage 2) of workshops Prepare summary of priority training and resource needs: <i>used as an input for stage 2 workshops</i>
Stage 2 Aim: Identify potential solutions	<ul style="list-style-type: none"> Identify potentially helpful ideas for interventions as perceived by participants Categorise proposed ideas for interventions in terms of the target recipient group: HV, parent and provider organisation 	<ul style="list-style-type: none"> List of potentially helpful ideas for interventions targeted at barriers at the level of HVs, parents and provider organisation 	<ul style="list-style-type: none"> Select suitable intervention strategy Theoretical analysis of HV-level barriers and facilitators Identify relevant intervention functions and potentially useful BCTs; operationalise the BCTs; operationalised BCTs were <i>used as inputs for stage 3 workshops</i>
Stage 3 Aim: Select BCTs and their mode of delivery	<ul style="list-style-type: none"> Rate potentially relevant BCTs for their importance and acceptability in local context Identify HVs' perspectives of (1) relevant topics and activities for an interactive training intervention; and (2) factors that can facilitate/promote HVs' participation and enhance their experience of participation 	<ul style="list-style-type: none"> List of potentially relevant BCTs (operationalised versions thereof) and mode(s) of delivery that are perceived as relevant and acceptable in the local context 	<ul style="list-style-type: none"> Select BCTs (and their modes of delivery) assessed as important and acceptable in the local context by WS participants; combine the selected BCTs into a cohesive, deliverable intervention Develop the draft of an interactive face-to-face training intervention
Stage 4 Aim: Select outcomes for a future feasibility study	<ul style="list-style-type: none"> Rate the importance of parameters and the feasibility of the methods to estimate them (they were identified from relevant literature), in the local context 	<ul style="list-style-type: none"> List of parameters and methods (for estimating them) that are considered as important and feasible, in the local context 	<ul style="list-style-type: none"> Select feasibility outcomes (parameters) and methods that could be used for a feasibility study of the intervention

4.4.4 Evaluation of the workshops

A key aspect of interactive workshops is the requirement for the researcher to provide a combination of techniques, activities and support that enables participants to better understand the information presented, explore context, and generate ideas (375).

Understanding what works best to achieve stakeholder engagement and involvement in behaviour change research is important (376). Health visitors (HVs) were active participants of the workshops, and they are also the potential recipients of the intervention. Therefore, it was relevant to explore HVs' experiences of participation in the workshops and their views of the activities that were intended to promote creativity and participation. Participants completed a pre-designed workshop evaluation questionnaire which collected information about their experiences at the conclusion of each workshop. The methods and findings of the evaluation are reported in detail in Appendix L.

4.4.5 Approach to analysis of workshop data

The participatory workshop activities generated diverse types of qualitative and quantitative data. These included audio recordings (feedback following group activities), text data generated from individual and group activities (on cards, flip chart sheets, post-it notes), and dot-voting data. These heterogeneous data represented participants' decisions about contextual relevance, priority ranking and rating for acceptability/importance of items; ideas about content; and preliminary analytical work carried out by participants of self-generated data from workshop activities.

The iterative and emergent nature of the overall process involving a series of workshops that took place in quick succession meant that preliminary analysis of all key outputs from each workshop had to be completed in time for the subsequent workshop. Therefore, instead of transcribing the audio recordings verbatim immediately after each workshop (a time-intensive task which was undertaken at a later stage to enable a comprehensive analysis of the findings), the contents of the audio recordings were compared with the written information on flip chart sheets (summaries of group discussions prepared by participants), to determine accuracy and comprehensiveness of the data. Following this scrutiny, notable participant contributions from the audio recordings were transcribed and pooled alongside the text on flip chart sheets, cards and post-it notes.

Data analysis was an iterative and ongoing process and involved different modes of analysis throughout the research process (377). Quantitative and qualitative data generated from the activities undertaken at each workshop were analysed by me (the researcher) after the conclusion of the workshop. The findings from the preceding stage of the workshops were used to design the content of workshop activities for the subsequent stage of the workshops. Key data from the preceding stage of the workshops were summarised (concise reports were prepared using bullet points and tables), for the purpose of presenting the information to participants of the subsequent stage of the workshops. Participants at the workshops engaged in the activities and provided their insights of the relevance and potential implications of the findings in the context of their own practice. Although participants' actions were not identified formally as "data analysis", analytic activity was implicit in the interpretation work that was performed by participants at the workshops as we progressed through the different stages of the intervention development.

Qualitative data analysis

Undertaking rigorous analyses of large quantities of diverse forms of qualitative data can be challenging. Currently, there is little guidance in the literature regarding what may be the best approach to analysis of heterogeneous primary qualitative data generated from workshops to ensure that the synthesised data are reliable and valid (244, 270). For this research, the Framework Analysis (FA) method was adopted to conduct thematic analysis of the qualitative data (378). In this method, the qualitative principle of researcher subjectivity is combined with a structured systematic approach to coding, but without the use of coding reliability measures. As the name implies, the end-product of the data analysis process in FA is a framework consisting of a series of main themes and related subtopics, addressing the research question(s) (227). This analysis process is based in and driven mainly by emergent data and typically guided by *a priori* knowledge of the topic. The FA method is widely used in mixed methods applied health research projects for analysis of qualitative data and was considered an appropriate method for this research because (379-381):

- The research questions that were explored are suitable for FA; these questions fell into four categories: contextual (e.g., attitudes and beliefs, identification of needs, existing practice environment), diagnostic (e.g., factors underlying attitudes and beliefs),

evaluative (e.g., factors affecting successful implementation of recommended practices), and strategic (e.g., identification of solutions to overcome the barriers).

- FA method emphasises how both a *priori* knowledge of the topic and emergent data should guide the iterative development of the framework; this fitted with the aims of this research, in that the knowledge gained from the systematic review had identified certain pre-defined areas that I wanted to explore in the local context.
- The FA method allows the user to perform data analysis both during and after data collection; this fitted with the needs of this research in that preliminary analysis of the data could be performed immediately after each workshop, with a comprehensive analysis carried out after completion of all the workshops.
- The use of original data (participant quotes) to complete the analysis in FA demonstrates transparency of the process and allows others to make judgments.

The analysis of the qualitative data was carried out iteratively in five steps (378):

- 1) Familiarisation with the data: listening to audio recordings and reading participants' notes, to identify and take notes of key ideas, concepts, and recurrent themes.
- 2) Identifying the framework: emerging themes from the key issues and concepts that were identified in the data formed the basis of an evolving framework (notes taken during the familiarisation step and *a priori* knowledge of the topics supported this process); the iterative development of the framework involved making judgments about meaning and relevance of the issues, and any implicit relationships between the issues; the objective was to develop a framework that fully addressed the research questions.
- 3) Indexing: identifying portions or sections in the original data (e.g., transcriptions of audio recordings, written notes on flip chart sheets, post-it notes) that corresponded to a particular theme or subtheme.
- 4) Charting: placing the specific extracts of data (identified from indexing) on the appropriate themes/subthemes of the framework.
- 5) Mapping and interpretation: presenting the different themes, subthemes and supporting extracts from participants' data as a schematic diagram or table.

Quantitative data analysis

Descriptive statistics (proportions and frequencies) (382) were used to summarise the

quantitative data (numerical data) generated from various dot voting activities.

Where appropriate, the analysis of the quantitative data representing participants' views of rating for relevance (or non-relevance) of items, acceptability, and feasibility (in the local context) were 'triangulated' with the concepts and themes identified from the thematic analysis of the qualitative data, to establish corroboration of the evidence from two sets of data. The results from the analyses were grouped together into "findings" to inform the specific stages of the development of the intervention.

4.4.6 Approach to theory driven analyses of data

The Capability-Opportunity-Motivation- Behaviour (COM-B) model of behaviour which is located at the centre of the BCW (218) recognises the importance of all the relevant factors influencing behaviour. The model was used to analyse how the barriers and facilitators influenced HVs' capabilities (C), opportunities (O) and motivations (M) for engaging, or not engaging, in the practice behaviours. This analysis enabled an understanding of what needs to change at individual HV-level to facilitate the implementation of the desired practice behaviours (or stop undesirable behaviours).

4.5 Development of the intervention

The steps of the BCW (218) were used as a guide to move from a behavioural analysis of the problem to iteratively design the intervention, informed by the evidence from the literature and evidence generated from the workshops. The completion of the tasks in each step created an end-product that informed the next step. These findings are presented here sequentially, in accordance with the stepped approach of the Implementation Intervention development framework selected for this research.

4.5.1 Phase 1. Understand the 'problem'

The research activities carried out in Phase one laid the groundwork for the designing of the intervention. These desk-based activities were completed to develop an understanding of the problem that the intervention aims to address. This phase had two specific objectives:

Objective 1.1 Define the problem: identify the evidence-practice gap.

Objective 1.2 Identify and specify the behaviours of interest for the intervention.

Objective 1.1. Identify the evidence-practice gap (desk-based research)

Method

As outlined in Chapter three, a mixed-methods systematic review (SR) was conducted to examine primary care practitioners (PCPs)' care practices for prevention of overweight in children aged 0-5 years; and barriers to and facilitators of implementation of guideline recommended practices, as perceived by PCPs. A thematic analysis was conducted on the extracted data, to identify the gaps in evidence-based practices and barriers and facilitators. The barriers and facilitators were categorised into the subcomponents of the COM-B model of behaviour.

Findings

The findings of the SR are described in detail in Chapter three of this thesis. The review confirmed that practitioners inconsistently address childhood obesity prevention in primary care. PCPs' views about the importance of the recommended practice and their beliefs about the time and the skills required to deliver them varied. Barriers and facilitators were identified at the level of the individual PCP (e.g., self-efficacy), parents (e.g., lack of motivation), and organisation level (e.g., lack of obesity training). Factors were categorised into the subcomponents of the COM-B model: psychological capability (e.g., knowledge and confidence), physical opportunity (e.g., time constraints), social opportunity (e.g., concern about harm to PCP-parent relationship), reflective motivation (e.g., beliefs about effectiveness of PCP's prevention efforts), and automatic motivation (e.g., feeling of discomfort and embarrassment, due to the stigma associated with obesity). The behavioural analysis of the barriers and facilitators provided an understanding of the complexity of implementing childhood obesity prevention practice behaviours and the factors that need to be addressed, to improve PCPs' childhood obesity preventive care.

Objective 1.2. Identify and specify the behaviours (desk-based research)

Method

The behaviours of interest for the intervention were the multiple behaviours that HVs perform (or are expected to perform), in the context of their role in delivery of the HCP 0-5 and two linked key public health outcomes where HVs are believed to have high impact: promotion of breastfeeding, and healthy weight, healthy nutrition in children aged 0-5 years (149). These practice behaviours were identified by reviewing the HCP 0-5's framework for

action to reduce risks of obesity for 0-5-year-old children (143), guidance published for health visiting staff by UK's National Institute for Health and Care Excellence (NICE) (5, 57, 140, 158, 160-163) and by Public Health England (149, 155). The behaviours were then specified using the AACTT (Action, Actor, Context, Target, Time) behaviour specification framework (383). Rearranging the domains in the framework provides a method to specify a behaviour by asking the following questions: what is the clinical behaviour that is being addressed (Action); who performs the behaviour(s) (Actor – this could be an individual practitioner or a team); when (Time) and where (using a broad sense of Context which may include not only the physical location but also social or emotional context) do they perform the behaviour(s); and, with whom (or for whom) the behaviour is performed (Target).

Findings

A comprehensive summary of the guideline recommended practices for HVs for the prevention of excess weight gain in 0-5-year-olds is included in Chapter one (Table 1.1, pages 23-24). The focus on multiple behaviours allowed specification of the behaviours of interest at two levels using the AACTT framework (383). At the general level, the health promotion and preventive care practice behaviours were specified as: HVs (Actor) to provide guideline recommended advice and support (Action) to promote healthy and prevent excess weight gain in the child (Target), during routine mandated visits (Time) that take place within the HCP 0-5 service (Context). At behaviour-specific level, the different recommended behaviours that form part of a larger behaviour were grouped together into "behaviour areas" and specified using the AACTT framework, as shown in Table 4.4, below.

Table 4.4 Specification of HVs' practice behaviours using AACTT framework

Actor	Health Visitor or HCP 0-5 staff
Actions	Behaviour area: Weight assessment and communication. Assessment of weight, height (length for children under 2), and growth of the infant. Monitor, plot and record weight and height/length of the child on appropriate growth percentile charts (frequency as recommended in guidelines) in child's records and parent-held Personal Child Health Record; interpret and assess risk of excess weight gain; discuss findings with parents
	Behaviour area: Risk communication. Assess parent-level risk factors; assess infant diet and nutrition, feeding practices, physical activity, sedentary behaviours (screen time use), and sleep; identify infant's risk of developing obesity and explain the risks to parents/carers; assess parents' readiness and motivation to change
	Behaviour area: Health promotion and prevention of overweight. Provide tailored and practical advice, information, and support; use recommended approaches to reinforce consistent health promoting messages, guidance, and support for behaviour change; provide information about community programs; referrals to other practitioners and/or services when indicated by guidance
Context and Time	Visits/reviews (at home/health centre) specified for HCP 0-5 delivery in County Durham; any HV- or parent-initiated contact which on topic of infant's weight, infant diet and feeding practices, sleep, physical activity (play)
Target	0-2 year old children and their parent(s)/carer(s)

4.5.2 Phase 2. Identify priority modifiable barriers and facilitators.

There were three objectives within phase two:

Objective 2.1. Identify barriers and facilitators, spontaneously mentioned by participants.

Objective 2.2. Assess the relevance in the local context of barriers and facilitators identified in the recently completed systematic review.

Objective 2.3 Priority ranking of the barriers, informed by participants' rating of the importance and changeability of the barriers.

In the following sections, the method(s) used within each objective and the results and findings from the work completed within each objective, are described using narrative text and tables.

Three Stage one workshops were held with HV teams A, B, and C on 13/5/2019, 20/5/2019 and 12/6/2019 respectively. The workshops were attended by 18, 11 and 24 HVs, respectively.

Objective 2.1. Identify locally relevant barriers and facilitators (first and second Stage one workshops)

Methods

Participants were first presented with a summary of the practices that HVs are expected to carry out in the context of their role in supporting families with prevention of excessive weight gain in children aged 0-2 years (included in Appendix M). The summary listed practices that correspond to guidelines published by National Institute for Health and Care Excellence (NICE) for health professionals (including HVs) (reference: Table 1.1, Chapter one). Participants first worked individually and then came together in groups to discuss their individual ideas regarding factors that they perceived as barriers to and facilitators of their childhood obesity prevention practices in the local context. They also identified resource and training resources which, if met, could potentially facilitate implementation of recommended practices. The barriers and facilitators were grouped into categories - those related the parent/family, HVs, HV-parent interaction and the provider organisation.

Findings

Twenty barriers were spontaneously identified by participants as relevant in the context of their own practice; these were categorised at the level of parent/family, HVs, HV-parent interaction, the environment (socioeconomic), and the provider organisation. An overview of these barriers, along with extracts from participants' data, is presented in Table 4.5, below. Participants spontaneously identified nine facilitators; these were categorised at the level of the HV, organisation and HV-parent interaction; a summary of the facilitators, along with extracts from participants' data, is presented in Table 4.6. The majority of barriers and facilitators spontaneously identified by participants had previously been identified in the SR. In addition, several training needs (such as use of BMI for weight monitoring, obesity prevention training and communication skills) and resource needs (such as summaries of updated guidelines, decision making support tools and educational materials to give to parents) were identified. Participants also made several recommendations to improve the quality of care; these included professional autonomy of their role, more opportunities for contact with children and families and consistent caseloads (to enable building of better working relationships with parents); these are summarised in Table 4.7. Photographs of examples of cards showing the barriers, facilitators, and resource needs spontaneously mentioned by participants are attached (see Figures 4.4 and 4.5).

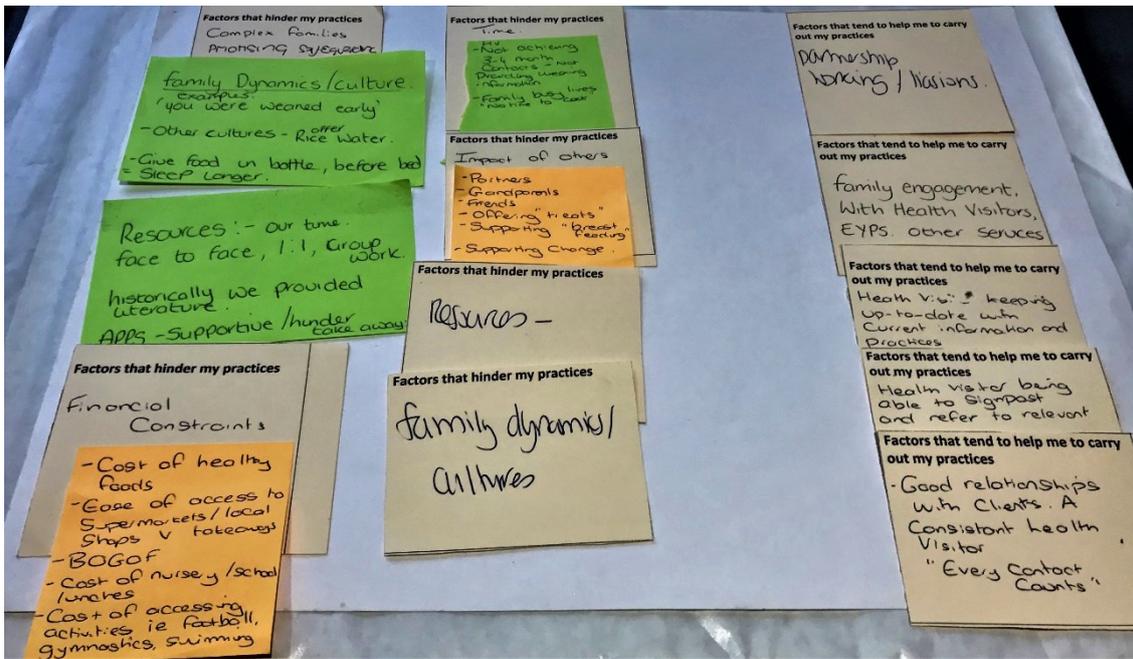


Figure 4.4. Examples of cards with names of spontaneously mentioned barriers and facilitators

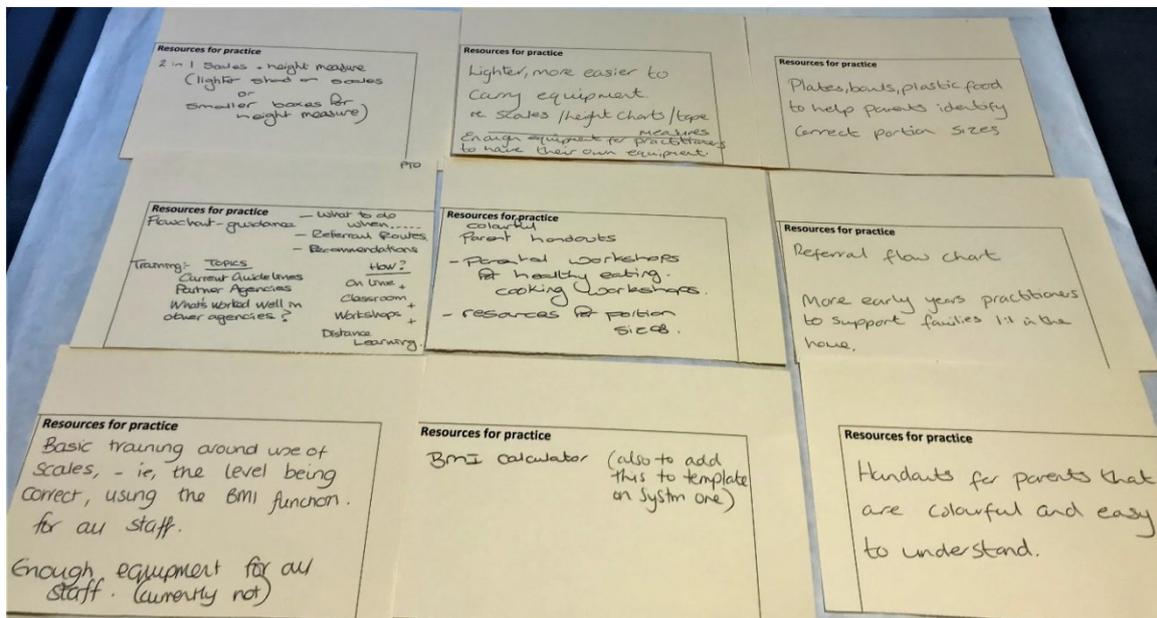


Figure 4.5. Examples of cards with names of spontaneously mentioned resource needs.

Table 4.5. Barriers spontaneously mentioned by participants (n=20).

Level of the barrier	Description of the barrier	Supporting extracts from participants' data
Parent/family related factors (assumptions and beliefs of participants)	Socioeconomic situation	<i>"...financial constraints – so the costs of healthy foods..."</i> <i>"...healthy food is seen as expensive and can be expensive..."</i>
	Lack of understanding	<i>"Another factor that hinders practice - parental understanding...so you've got the educational level, any learning difficulties or disabilities"</i>
	Parental overweight	<i>"Parental weight and normalisation of obesity within the household"</i>
	Lack of motivation/ lack of concern	<i>"We need to assess parental engagement and the motivation to change because there is no point in planning a lot of resources into a very resistant family that have no interest in moving in that fight".</i> <i>"...some houses prioritise having a bigger television then having healthy foods in the house..."</i>
	Families with complex problems	<i>"Chaotic lifestyles which overtook health priorities and complex family dynamics could be a factor".</i>
	Perception of healthy child weight	<i>"Parental perception of a healthy weight because there is still that you know fat baby healthy baby thing".</i> <i>"...cultural, culturally it's good, it's healthy to have a chubby baby..."</i>
	Parental lifestyle - working parents	<i>"...families having busy lives – no time to cook..."</i>
	Influence of grandparents	<i>"Grandparents or carers tend to give the kids what they want, treats, sweets, stuff like that but then the parents are left trying to correct their child...so sometimes there is big conflict within families."</i>
Practitioner related factors	Disagreement with content of guidelines	<i>"Disagree that BMI should be calculated for children under 5 years old; instead, height and weight charts should be used"</i> <i>"...we've had discussions about that (introduction of complementary foods), which research is correct because there's a lot of research around that four month can be better..."</i>
	Limited knowledge of the topic	<i>"Limits to the extent of our practice due to time and knowledge constraints"</i>
	Lack of familiarity with guidelines	<i>"Know enough of basic facts of healthy eating but not guidelines update"</i>
	Lack of confidence	<i>"Practitioners to raise the issue of obesity, lack of confidence in delivering difficult messages"</i>

Level of the barrier	Description of the barrier	Supporting extracts from participants' data
Parent-HV Interaction	Harm to relationship with family	<i>"...fear of damaging the professional relationship"</i>
	Concern about offending the parent	<i>"A direct criticism, that if you raise weight as a concern, and I've had this myself...where a child's been climbing through the centiles...then the child is not brought back because they don't want to engage in that conversation. It's very sensitive."</i>
Organisational factors	Lack of training	<i>"One barrier is the lack of training about food, about exercises for children, about portion sizes. A lot of what we learn is, along self-learning is from the Internet...no structure of learning"</i>
	Time constraints /Competing priorities	<i>"And time constraints sometimes there is so many public health priorities so time constraints can influence what you're delivering within a visit"</i> <i>"...at the minute it's not one of our KPIs [key performance indicator] so it's not one of our set targets"</i>
	Lack of practice tools	<i>"Lack of equipment...we're reduced on the height and weight measures, scales; a lot of our health visitors only have the budget scales for the babies and don't have the stand on the scales"</i>
	Lack of united, coherent approach	<i>"They (GPs) are not as concerned as maybe we are a lot of the time. I think the GPs have got much more input when a child is not gaining weight, when a child has gained more weight than expected they tend to bounce it back to the health visitor"</i>
	Lack of organisational support	<i>"Organisational resources are limited; they are prioritised to deliver short-term outcomes"</i> <i>"Limited funding...We don't have sufficient, enough venues, resources to be able to support breastfeeding..."</i> <i>"We can offer a visit at 3-4 month which focuses on development and discuss weaning but it's not one of the essential contacts so if we are short of staff and time it is one of the visits we sacrifice"</i>
Environmental factors	Marketing of baby foods promotes early weaning	<i>"...and advertising...so if you go to the supermarket weighing the products that are for children and they're available are they advertised as 3 to 4 months, so you get mixed messages about food when to introduce food"</i>

Table 4.6. Facilitators spontaneously mentioned by participants (n=9).

Level of the facilitator	Description of the facilitator	Supporting extracts from participants' data
Practitioner factors	Awareness of guidelines	<i>"Health visitors keeping up-to-date with the current information and the practices around baby led weaning and current exercise recommendations for pregnant ladies and young children"</i>
	Awareness of local services	<i>"Health Visitor having an awareness of the services around so being able to signpost and refer to the relevant services ..."</i>
Parent-HV interaction	Positive relationship with parent	<i>"Health visitor having a good relationship with the client, have the same consistent health visitor..."</i>
	Receptive and engaged parents	<i>"Family wants to engage in change and building relationships..."</i>
Organisational factors	Collaborative working	<i>"We have the ability to ask the wider team to help our early years practitioners to support with healthy diet, breastfeeding groups and training"</i>
	Availability of resources	<i>"Resources we've got – steps nutrition, websites, baby buddy app, things like that – they all have information"</i>
	Support from doctors of nurses' decisions	<i>"Confidence that when we do refer children about their weight that our evidence isn't undermined and that our concerns are actually raised"</i>
	Role support from organisation	<i>"...being able to signpost and refer to the relevant services like...the healthy start, cookery classes, paediatric referrals and dietician...local breastfeeding groups"</i>
	Continuity of care	<i>"The things that tend to help...have the same consistent health visitor"</i>

Table 4.7. Resources and training needs, and recommendations mentioned by participants.

Resource needs	
Topic	Supporting extracts from participants' data
Weight assessment and monitoring tools	<i>"Stand-on scales, BMI calculators and also adding these to the templates to SystmOne" [centrally hosted clinical computer system]</i> <i>"Lighter, easier to carry equipment"</i>
Decision making support tools	<i>"...BMI calculator...perhaps incorporating into that an app that we can share with parents that will have information about local resources, dietary advice, simple to follow pathways for us and for parents so that we all know what to do when"</i>
Updated guidelines	<i>"Up-to-date nutritional guidelines, Up-to-date weaning guidelines"</i> <i>"Specific referral criteria and specialist pathways"</i>
Resources to give to parents	<i>"Something to help parents understand portion sizes, again which could be incorporated in an app"</i> <i>"Hand-outs for parents that are colourful and easy to understand"</i>
Training needs	
Topic	Supporting extract from participants' data
Use of BMI	<i>"Some more information about the BMI, interpreting it and explaining the relevance to parents"</i>
Knowledge of updated guidelines	<i>"Perhaps some training on what the current guidance says"</i> <i>"Training on portion sizes for practitioners so we are giving the right information to parents"</i>
Communication skills	<i>"Require training around initiating conversations without creating barriers"</i>
Recommendations	
Topic	Supporting extract from participants' data
Empowerment of their role	<i>"Freedom of the staff to actually follow the healthy child programme and not to have to cover other things"</i>
Continuity of care	<i>"...have the same consistent health visitor, making every contact count, our early mandated contacts"</i>
More opportunities for contact	<i>"Reinstate 3-4-month home visit; "making every one of our early contacts mandatory to be led by the HV"</i>
Partnership working	<i>"We were thinking around family engagement with the health visitors and our early years practitioners, they have a really good skill set to be able to contribute to that within helping one of the services"</i>

Post-workshop analysis

Participants spontaneously mentioned many barriers external to them, more specifically barriers at the levels of the parent and service provider. These barriers included parental lack of motivation, parental overweight and lifestyle, and parents' belief that heavier infants are healthier. Barriers at the level of the service provider included multiple competing priorities within core HV role/responsibilities which impacted upon HVs' time, lack of

practice tools and materials, lack of obesity training, and lack of continuity of care (changing caseloads prevented development of positive trusting relationships with families).

Participants' views were that their practice was driven by the requirement to meet organisational targets and current priorities; these were described as safeguarding and child protection, and child and maternal mental health. Lack of support of HVs' decisions from general practitioners (GPs) was attributed to the lack of clear organisational and national protocols and pathways of care for obesity prevention in children aged 0 to 5 years.

HV-level barriers included lack of agreement with guideline content and/or the evidence underpinning the guideline. HVs disagreed that BMI must be assessed for children <4 years of age; they held the view that standard weight and height charts are appropriate. They questioned the evidence underpinning the recommendation to delay introduction of complementary foods until an infant is 6 months old; many HVs believed that solid food can be introduced from 4 months onwards. HVs expressed lack of confidence in sensitively discussing weight related topics with parents, fear of offending parents and evoking negative emotional responses, and concern about harm to the HV-parent relationship.

Two barriers emerged from workshop data that were not identified in the SR. Participants identified the availability in UK supermarkets of wide range of ready-to-eat infant foods (labelled by manufacturers as suitable for 4 months old infants) as a barrier because they believe it promotes early introduction (prior to 6 months) of complementary foods.

Participants also pointed out that regular monitoring of the weight of children aged 2 to 4 years is not a key performance indicator for evaluation of health visiting services in England and therefore, HVs did not prioritise this activity when they were faced with time constraints.

Parental receptiveness to advice, a positive HV-parent relationship, collaborative working with other practitioner groups, and support from the organisation (consistent caseloads, practice tools and resources for HVs and educational materials for parents) were identified as key facilitators. The facilitators spontaneously identified by workshop participants were also identified within the SR.

Objective 2.2. Examine the contextual relevance of barriers and facilitators identified in the systematic review (SR) (first and second stage one workshops)

Method

Following the spontaneous description of barriers and facilitators, participants were presented with a summary of the findings of the previously completed SR, and cards bearing the names of 21 barriers and 10 facilitators that were identified by me as key determinants of PCPs' practice behaviours from the evidence synthesis (reference: Figures 3.6, and 3.7, Chapter three). The cards also specified the level of the barrier/facilitator (practitioner, parent, practitioner-family interaction, and organisation); illustrations of the cards are presented in Appendix N. Participants expressed their individual views about the relevance of these determinants in the context of their own practice, by placing one coloured sticky dot (green = relevant; red= not relevant; orange= uncertain/neutral) of their choice on each card. Participants' responses on rating of the barriers and the facilitators were analysed to examine the extent to which they were perceived as relevant in the local context. The findings from objective 2.1 and objective 2.2 were compared to identify barriers and facilitators that were mentioned spontaneously by participants *and* identified in the SR, those unique to the SR, and those unique to participants (i.e., not identified in the SR). The ratings for contextual relevance of these different sets of barriers were compared.

Findings

The findings of the rating for contextual relevance by participants of the barriers and facilitators identified in the SR are summarised below in Table 4.8 and Table 4.9, respectively. Photographs of examples of cards showing the rating work are attached below (Figures 4.7 and 4.8). All seven parent-level barriers and four out of six organisation-level barriers identified in the SR were rated as locally relevant by majority of workshop participants. Although 'lack of obesity training' was identified as a relevant barrier by majority (60%) of participants, 'practitioner's lack of knowledge, skills and confidence' was identified as a relevant barrier by only 42% of participants. Among the SR-identified facilitators, majority of participants identified all four practitioner-level facilitators (including 3 not spontaneously mentioned) as contextually relevant; however, only 1 (out of 4) organisation-level facilitator identified in the SR was regarded as contextually relevant by participants

Table 4.8. Rating of SR-identified barriers for their perceived relevance in local context; the barriers that were common to HVs *and* the SR and those unique to the SR are indicated. Barriers that were spontaneously mentioned by HVs (but not identified in the SR) were not rated but are listed here, to provide a comprehensive summary of all the barriers. Emboldening indicates those endorsed by a majority ($\geq 50\%$) of participants.

Barrier	Description of the barrier (21 were SR-identified)	Rating for relevance of the barrier by participants (n=29), expressed as % (rounded value)			SR-identified barriers		Barrier not identified in the SR
		Relevant	Not relevant	Uncertain	Common to HVs and SR	Unique to the SR	
Practitioner level	Lack of knowledge, skills, and confidence	42	38	20	✓		
	Disagreement with guideline(s)/evidence underpinning the guideline	52	27	21	✓		
	Lack of familiarity with guideline content	49	21	30	✓		
	Belief: my advice does little to prevent childhood obesity	53	36	11		✓	
	Uncertainty about identifying infants as obese	15	66	19		✓	
	Belief: prevention primarily a responsibility of parents	53	34	13		✓	
	Beliefs about role and responsibilities (uncertainty about own role in prevention)	26	28	36		✓	
Practitioner-parent interaction	Fear of offending parents	60	17	23	✓		
	Concern about harm to relationship with parents	30	26	43	✓		
Family level (assumptions and beliefs of practitioners)	Parent/family's socioeconomic situation	83	7	10	✓		
	Lack of motivation/lack of concern	87	6	7	✓		
	Lack of knowledge and skills (parenting)	58	16	26	✓		
	Perception: heavier infants are healthier	81	11	8	✓		
	Parental overweight and lifestyle	92	4	4	✓		
	Parents have numerous complex life issues to deal with	75	13	11	✓		

Barrier	Description of the barrier (21 were SR-identified)	Rating for relevance of the barrier by participants (n=29), expressed as % (rounded value)			SR-identified barriers		Barrier not identified in the SR
		Relevant	Not relevant	Uncertain	Common to HVs and SR	Unique to the SR	
	Unhealthy infant/child feeding practices	85	15	0		✓	
	Availability of infant foods labelled as appropriate for 4 months-old infants in supermarkets	Barrier spontaneously mentioned by participants					✓
Organisation	Time constraints and competing role-related priorities	79	8	13	✓		
	Lack of support from organisation (budgets, staffing)	40	30	30	✓		
	Lack of obesity training	60	4	36	✓		
	Lack of tools and materials for practice	91	4	5	✓		
	Lack of collaboration between different practitioner groups	55	10	35	✓		
	Regular monitoring of weight in children aged 1-4 years is not a key performance indicator	Barrier spontaneously mentioned by participants					✓

Table 4.9. Rating of SR-identified facilitators for their perceived relevance in local context; the facilitators that were common to HVs and the SR and those unique to the SR are indicated. Emboldening indicates those endorsed by a majority ($\geq 50\%$) of participants.

Facilitator	Description of the SR-identified facilitator (n= 10)	Rating for relevance of the facilitator by participants (n=53) expressed as % (rounded value)			SR-identified facilitator	
		Relevant	Not relevant	Uncertain	Common to HVs and SR	Unique to SR
Practitioner level	Familiarity with guideline content	68	9	23	✓	
	High level of competence and confidence (self-rated)	58	15	26		✓
	Ability to use innovative communication strategies	70	11	19		✓
	Belief: my advice and support make a difference	60	25	15		✓
Practitioner-parent interaction	Receptive, engaged parents	45	25	30	✓	
	Positive relationship with family	77	4	19	✓	
Organisation	Accessible, adequate training opportunities	34	34	32		✓
	Availability of practice tools	47	32	21	✓	
	Collaboration between different practitioner groups	38	26	36	✓	
	Support from organisation for practitioner's role	53	26	21	✓	

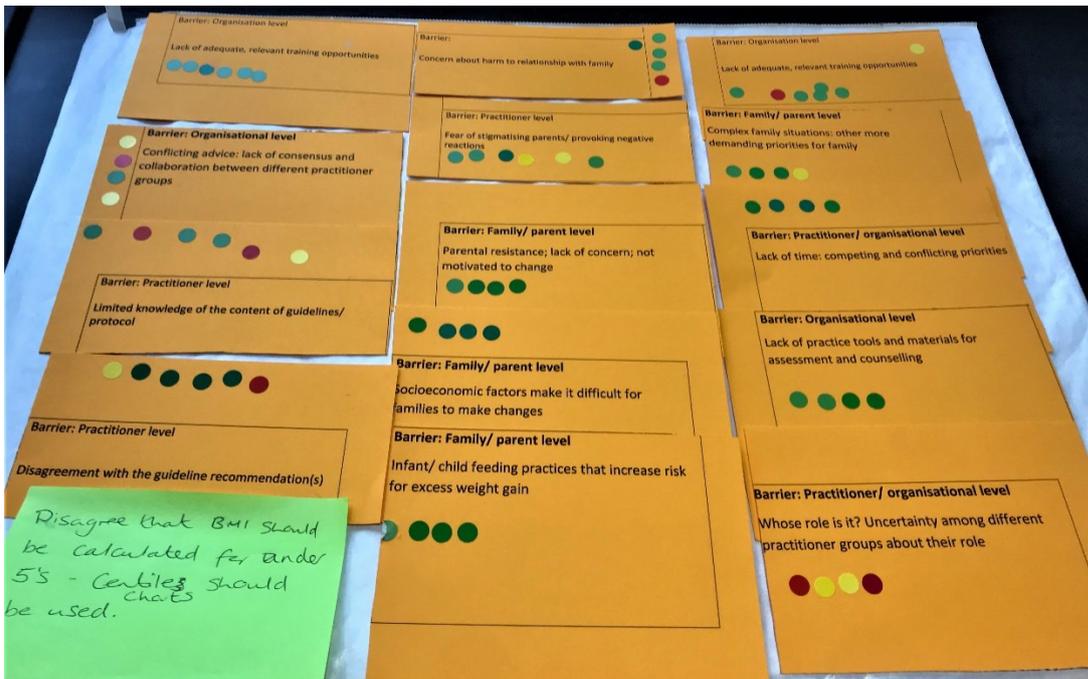


Figure 4.6. Examples of cards showing participants' rating of relevance in local context of barriers.

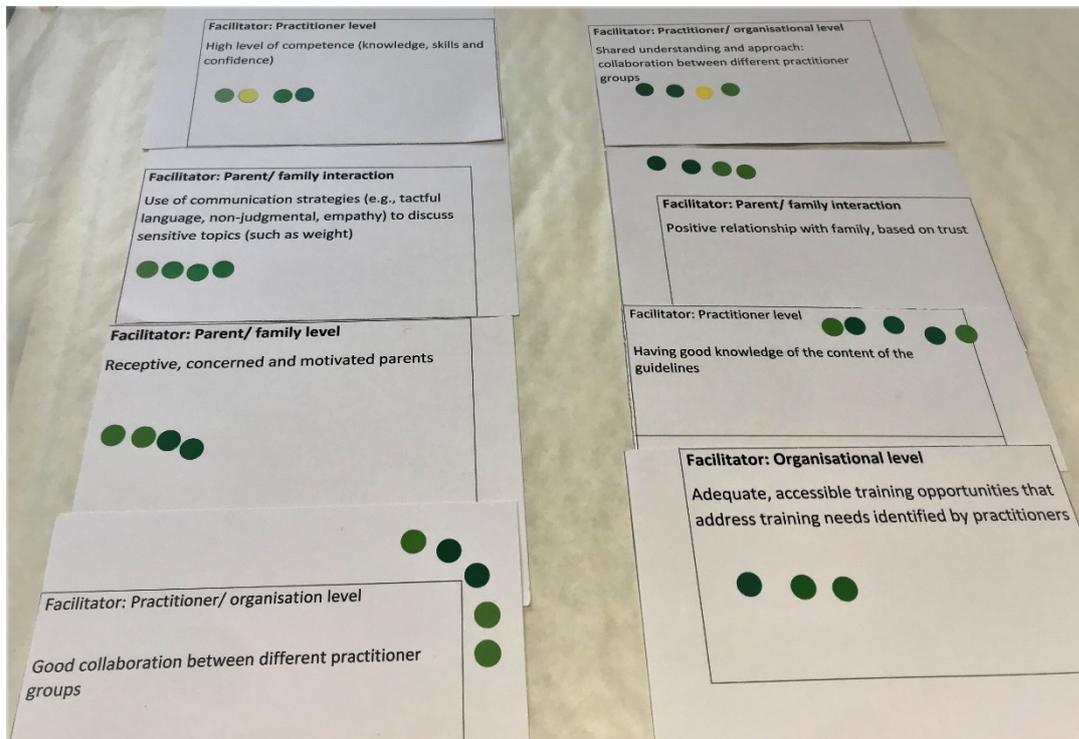


Figure 4.7. Examples of cards showing participants' rating of relevance in local context of facilitators.

Among SR-identified facilitators, 'positive relationship with family' and 'ability to use innovative communication strategies' were most frequently rated as relevant. Although a substantial majority (77%) of participants identified 'positive relationship with family' as a relevant facilitator, almost one-third (29%) expressed they were uncertain/neutral if 'receptive, engaged parents', which was identified as an important facilitator in the SR, would be relevant for them personally. Upon inquiry, participants explained that they could not be certain that parents were engaged and compliant with HVs' advice and that parents' description of their infant feeding practices may not consistently reflect their *actual* practices. Participants' view was that some parents may be hesitant to openly discuss infant feeding practices because they (the parents) assume that non-compliance would attract judgmental or critical comments from healthcare staff.

Post-workshop analysis

The findings revealed that majority of the barriers and facilitators spontaneously mentioned by participants as relevant in the local context had previously been identified within the SR. As shown in Table 4.8, of the five barriers that were unique to the SR (i.e., they were not spontaneously mentioned by participants), three were rated as relevant by the majority of the participants and two were rated as relevant by a minority of the participants. Regarding the facilitators, all facilitators spontaneously mentioned by participants (shown in Table 4.6) were also identified within the SR as key facilitators. Of the four facilitators that were unique to the SR (i.e., they were not spontaneously mentioned by participants), three were rated as relevant by the majority of participants (Table 4.9, above).

The analysis also showed that a substantial number of participants allocated the response 'uncertain/neutral' to several barriers and facilitators that were identified in the SR but not spontaneously by the HVs themselves. These included barriers such as 'concern about harm to relationship with family' (43% uncertain/neutral), 'lack of training opportunities' (36%), 'lack of clear role specification' (36%), and 'lack of collaboration between different practitioner groups' (35%). Among facilitators, 'collaboration between different practitioner groups' and 'adequate, accessible training opportunities' were allocated the response 'uncertain/neutral' by 36% and 32% of the participants, respectively. Participants explained that although they could make sense of why these factors were identified in the literature as important barriers/facilitators, they could not be certain of the hindering/enabling effects of

these factors because they had not personally experienced these factors in the context of their own practice.

Objective 2.3: Priority ranking of barriers (workshop activity)

Method

Informed by the analyses of the outputs from objectives 2.1 and 2.2, I selected twenty barriers (and assigned them a unique identifying label), for the purpose of priority ranking of the barriers by participants (see box 4.1, below).

Box 4.1 List of the barriers (n=20) selected for priority ranking

Sixteen barriers mentioned spontaneously by participants and identified in the SR		
Level of the barrier	Brief description (identifying label)	
Practitioner	Lack of knowledge, skills, and confidence (P1)	
	Lack of familiarity with guideline content (P2)	
	Disagreement with guideline/evidence underpinning the guideline(s) (P3)	
Practitioner-parent interaction	Harm to practitioner-parent relationship (P7)	
	Fear of offending parents (P8)	
Family (assumptions and beliefs of practitioners)	Socioeconomic challenges to implement recommended guidance (F1)	
	Lack of motivation to change (F2)	
	Families with multiple complex issues (F3)	
	Lack of understanding and skills (F5)	
	Parental overweight and lifestyle (F6)	
	Misperception of healthy infant weight gain (F7)	
Organisation	Lack of training (O1)	
	Lack of tools and resources (O2)	
	Lack of time (O3)	
	Lack of collaboration between different practitioner groups (O4)	
	Lack of role- support from organisation (O5)	
Four barriers that were identified in the SR but were not spontaneously mentioned by participants		
Level of the barrier	Brief description (identifying label)	Remarks
Practitioner	Belief: my advice does little to prevent childhood obesity (P4)	Frequently reported as a key barrier in the SR; 53% of participants rated it as locally relevant; 13% were uncertain/neutral
	Uncertainty about identifying infants as overweight/obese (P5)	66% of participants rated the barrier as not relevant locally; reasons for including this barrier detailed below, in text
	Belief: prevention primarily parents' responsibility (P6)	More than half (53 %) of participants rated this barrier as relevant; 34% rated it as not relevant
Parent	Unhealthy infant/child feeding practices (F4)	Frequently reported as a parent-level barrier in the SR; 85 % of participants rated it as relevant

These barriers were selected because: (1) 16 of the 20 barriers were spontaneously mentioned as relevant in the local context by workshop participants *and* were also identified by the SR; (2) the other four barriers were unique to the SR and all - except one – were rated as relevant in the local context by majority of participants. My subjective decision to include the SR-identified barrier ‘practitioners’ uncertainty about identifying infants as overweight/obese’ that was rated as not relevant by 66% of workshop participants was based on: (1) this barrier was a frequently reported finding in the SR, including in studies reported from the UK; and (2) workshop participants reported very low use of BMI (and weight-for-length in infants) and uncertainty about relevance of BMI in very young children, which can make it difficult for HVs to assess overweight/obesity in infants.

The prioritisation ranking criteria for the barriers were participants’ ratings of their perceived importance (relevance) and changeability (how easy or difficult to overcome). The names of the twenty barriers were presented on cards (one barrier per card) alongside two questions (‘how important do you think X is’ and ‘how changeable do you think X is?’) and correspondingly, two rows of five boxes each for rating (for importance, 1 = not important, 2= slightly important, 3=moderately important, 4= important, 5=very important; for changeability, 1= very difficult to change, 2= difficult to change, 3= possible to change, 4=easy to change, 5=very easy to change). Illustrations of the cards are included in Appendix O. Participants at the third stage one workshop individually rated each of the 20 barriers for their level of importance and changeability in the local context (as perceived by them) by placing one sticky dot for each row on the box of their choice. The total number of responses allocated on boxes 3, 4 and 5 on the rows for importance and changeability for each barrier was computed to determine the “more important” score (I score) and “more changeable” score (C score) of the barrier.

The I score and C score of each barrier were multiplied, with the product (R) representing the priority rank score of each barrier ($R = I \times C$). For the priority ranking of the barriers, the median value of the R scores was computed. The individual barriers were then ranked by priority, giving the barrier with the highest R score the highest rank. The ten barriers with R scores above the median value were identified. The ranking information of the barriers was summarised (in a table and as a four-quadrant graph) and used as an input for the next stage (stage two) of workshops.

Findings

Twenty-two participants (workshop three, stage one) rated the twenty selected barriers (listed in Box 4.1, above) for the purpose of priority ranking, on the basis of their perceived importance and changeability. The findings are summarised in Table 4.10 below; the table shows the “more important” (I) and “more changeable” (C) scores, the priority ranking (R) scores (R= product of I and C), and the priority rank of the barriers. The top ten barriers were identified as those with R score above the median R score (this value was 262).

Table 4.10 Rating of barriers for their perceived importance and changeability. Shading shows the top ten priority ranked barriers; *where two barriers had the same score and were therefore had the same rank, the next rank was skipped.

Level of the barrier	Barrier ID	# of HVs who rated the barrier (n=22)		# of HVs who rated the barrier (n=22)		Priority rank score (R) R=I x C	Barrier's priority rank*
		Less important	More important(I)	Less changeable	More changeable(C)		
Practitioner (HV)	P1	3	19	2	20	380	2
	P2	5	17	3	19	323	4
	P3	1	21	3	19	399	1
	P4	4	18	9	13	234	18
	P5	7	15	0	22	330	3
	P6	2	20	9	13	260	11
HV-parent interaction	P7	8	14	4	18	252	12
	P8	4	18	7	15	270	9
Parent/family	F1	0	22	10	12	264	10
	F2	0	22	11	11	242	16
	F3	3	19	6	16	304	7
	F4	1	21	12	10	210	19
	F5	1	21	7	15	315	6
	F6	2	20	6	16	320	5
	F7	1	21	10	12	252	12
Provider organisation	O1	1	21	10	12	252	12
	O2	3	19	6	16	304	7
	O3	10	12	5	17	204	20
	O4	4	18	8	14	252	12
	O5	6	16	7	15	240	16

A photograph of some cards showing the priority rating of the barriers by workshop participants is presented (see Figure 4.8).

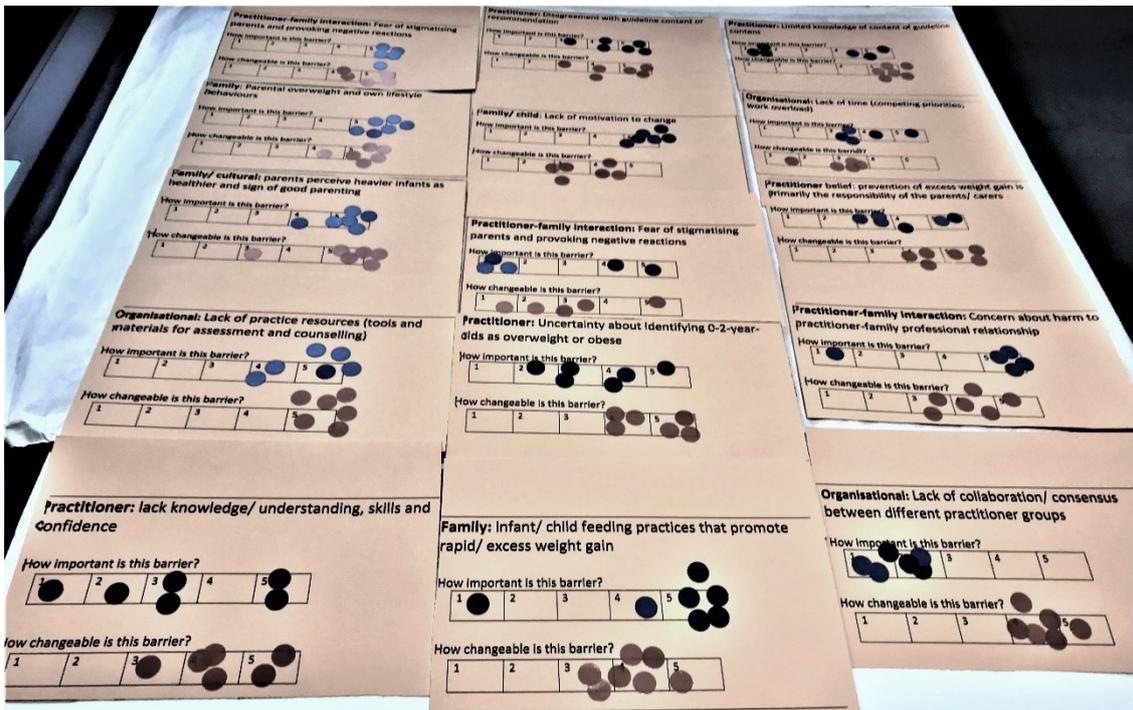


Figure 4.8. Examples of cards showing the priority rating work of the barriers by participants.

Post-workshop analyses.

As shown in Table 4.10, all parent-level barriers received high scores for importance (between 19 and 22 out of 22) but low scores for changeability (between 10 and 16 out of 22). Notably, the top five barriers with the highest changeability scores are at the level of the practitioner (HV) and HV-parent interaction. The priority ranking analysis revealed that the top four priority ranked barriers (representing barriers with the top four highest R scores) were all at the level of the individual practitioner. The barriers that emerged as the top ten priority ranked barriers are summarised in Table 4.11.

Table 4.11. The top 10 priority barriers, ranked by participants.

Rank	Description of the barrier (Barrier ID)	Comments
1	Practitioners' disagreement with guideline/evidence underpinning the guideline(s) (P3)	These top 4 priority ranked barriers – all practitioner-level barriers were frequently identified in the SR. In contrast, perceived high level of competence and confidence, and knowledge of guidelines were identified as practitioner-level facilitators within the SR and also by workshop participants
2	Practitioners' lack of knowledge, skills, and confidence (P1)	
3	Practitioners' uncertainty about identifying infants as overweight/obese (P5)	
4	Practitioners' lack of familiarity with guideline content (P2)	
5	Parental overweight and lifestyle (F6)	Participants overwhelmingly ranked these parent/family related barriers as “more important”; however, fewer viewed them as “more changeable”; all 3 barriers were frequently identified in the SR and by workshop participants
6	Parental lack of knowledge and skills (F5)	
7	Families with complex health and social issues (F3)	
8	Lack of tools and resources for practitioners (O2)	Most (19 out of 22) participants ranked this organisational-level barrier as “more important”, although fewer (16 out of 22) ranked it as “more changeable”; this barrier was also frequently reported within the SR. Availability of tools and resources was identified as an important facilitator in the SR and by workshop participants.
9	Practitioners' fear of offending parents (P8)	This barrier was ranked as “more important” by most (18 out of 22) participants; 15 out of 22 ranked it as “more changeable”; the barrier was frequently identified as an important barrier within the SR. Maintaining good relationships with parents was identified as an important facilitator within the SR and also by workshop participants.
10	Socioeconomic challenges for parents to implement recommended guidance (F1)	All participants ranked this barrier as “more important”; it was ranked “more changeable” by only 12 out of 22 participants; this family-level barrier was frequently identified as an important barrier within the SR and by workshop participants.

The scores for the importance and changeability of the individual barriers were plotted on a quadrant graph (X axis = importance, Y axis = changeability), to map them into categories: (1) higher importance and more changeable; (2) higher importance but less changeable; (3) more changeable but lower in importance; and (4) lower in importance and also less changeable (shown in figure 4.9, below).

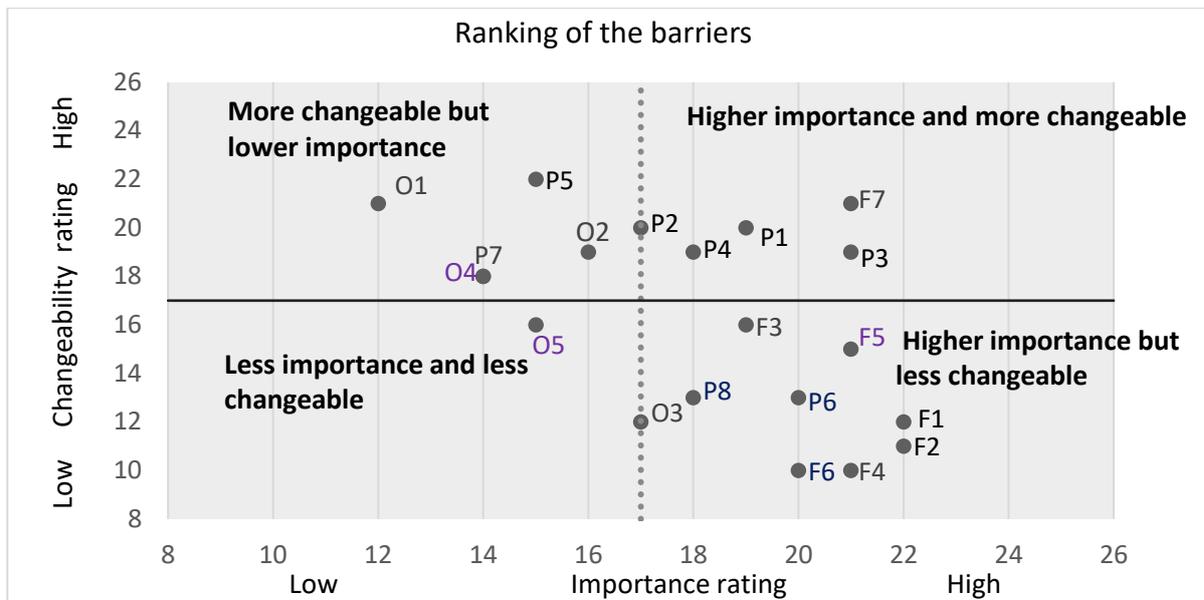


Figure 4.9. Barriers categorised in terms of their changeability and importance scores [reference: Box 4.1 and Table 4.11 above].

Mapping the ranking data of the barriers on the quadrant graph showed that 4 of the 5 barriers in the upper right quadrant – barriers rated by participants as of higher importance and more changeable - are HV-related barriers. This quadrant graph and the priority ranking information was used as an input for the next stage of the workshops.

4.5.3 Phase 3: Identify intervention content (BCTs) and implementation options.

Phase three had six specific objectives that were completed in a sequential manner:

Objective 3.1 Identify intervention strategy.

Objective 3.2 Theoretical analysis of the barriers

Objective 3.3 Identify intervention functions.

Objective 3.4 Identify potentially relevant behaviour change techniques (BCTs)

Objective 3.5 Specify form of delivery (how the BCTs will be delivered in an intervention)

Objective 3.6 Specify the hypothesised causal mechanisms of change (how is the intervention supposed to work?)

In the following sections, the method(s) used within each objective and the results and findings from the work completed within each objective, are described, using narrative text and tables.

Objective 3.1: Identify intervention strategy (informed by workshop activity)

Methods

Two stage two workshops that were held on 26/6/2019 and 10/7/2019 in which HVs from two teams (teams D and C, one per workshop) took part. Participants at these workshops were presented with (1) list of key barriers and facilitators identified by stage one workshop participants; (2) the priority ranking of the barriers; and (3) examples of interventions and programmes that have the potential to strengthen HVs' role in addressing excess weight in 0-2 year old children (included in Appendix P). To identify potentially promising interventions and programmes, I referred to the findings of the recently completed systematic review, findings of stage one workshops, and published relevant literature (209, 210). Participants engaged in group discussions to generate ideas about programmes and actions that they believed could support staff in implementing recommended practices and promoting practitioner-parent engagement. Participants categorised their ideas into those aimed at barriers at the level of the practitioner, parent, and service-provider organisation, respectively.

Findings

The two workshops were attended by 20 and 14 HVs (including two who work in managerial/supervisory roles) from HV teams D and C, respectively. HVs from Team C had taken part in the priority ranking of the barriers in stage one (third workshop), while Team D were naïve at this stage to the development process. Participants described a range of actions that they believed could potentially address the barriers at the level of HVs, parents and the organisation. These views were similar across both workshops. Education and training programmes for HVs were frequently mentioned. HVs also recommended education and support for parents and emphasised the need for resources and organisational support. The findings (along with from participants' quotes) are summarised below in Table 4.12.

Table 4.12. Participants' ideas about interventions.

Category	Proposed actions and interventions (with select verbatim extracts from participants' data)
<p>Workflow focused (minimise barriers and create enablers at parent level)</p>	<ul style="list-style-type: none"> • Education programmes for parents <i>"Start education of weaning in antenatal contact, so basically starting everything sooner and giving them all of the information"</i> <i>"Guidelines for parents and extended family"</i> • Smart-phone apps for parents (information and advice) • Interventions aimed at parents and children: healthy infant and toddler weight programmes • Community based healthy weight promotion programmes <i>"Health promoting events in the communities..."</i>
<p>Workflow focused (minimise barriers and create enablers at service provider level)</p>	<ul style="list-style-type: none"> • Increase opportunity for contact with children and families: restore HV-led visit at 3-4 months age <i>"...the 3 to 4-month health visitor contact should be mandatory..."</i> • Local Opinion Leader (HV team leader to facilitate training and mentoring support for staff) <i>"A health visitor lead, maybe develop a new post or a possible team to develop policies, training to support the staff"</i> • Decision support tools for practitioners • Clear care and referral pathways • Consistent caseloads (to enable staff –family relationship building) <i>"You have to build up your relationships with your families so keeping a steady constant consistent caseload"</i> • Greater autonomy of HV's role <i>"...freedom of the staff to actually follow the healthy child programme and not to have to cover other things"</i>
<p>Practitioner focused (minimise barriers and create enablers at HV-level)</p>	<ul style="list-style-type: none"> • Education and training for practitioners <i>"So...the main things that we came up with is that you could use an education intervention"</i> <i>"Keeping up-to-date with current research through newsletters..."</i> <i>"Additional training for health visitors and Early Years practitioners around policies and referral processes for children"</i>

Post-workshop analysis

The interventions proposed by workshop participants can be placed in two broad categories: practitioner-focused and workflow-focused. Workflow-focused interventions seek to minimise the barriers related to the practice environment (parent- and service provider-related barriers) and address issues that can potentially support HVs to adhere to guidelines (e.g., provision of practice tools for HVs and educational materials for parents). The

practitioner-focused interventions seek to minimise barriers and create facilitators at HV-level (e.g., provision of training). The findings suggest that several interventions appear to be necessary to address key barriers at the level of the individual practitioner, service provider organisation and the parent/family. These findings are in accordance with the evidence in the literature which suggests that change at multiple levels is required to produce sustainable improvement in PCPs' adherence to guidelines to address prevention of childhood obesity (191, 209).

Selection of the intervention strategy

It can be difficult to pinpoint the best strategy to improve implementation of guidelines even after thorough assessment and analyses of the multi-level barriers and the needs of the target group (384). Research-based evidence about the specific barriers to change can provide some guidance but cannot explicitly guide the decision about which intervention is most appropriate in all situations or circumstances. Typically, practitioners, health service researchers, education specialists, policy makers, healthcare service managers may hold different beliefs about what the barriers are and have different ideas about the best strategies to increase adherence to guidelines (385). An important consideration is availability of resources: evidence-based implementation efforts can be resource intensive and thus involve considerable costs. Practitioners and managers are likely to be critical of resource-consuming interventions. It is recommended that implementation interventions should aim at delivering an optimal effect at the lowest possible cost (386).

To select the most suitable intervention strategy in the context of this research, I took into consideration the priorities of Durham County Council (DCC) Public Health department which commissions the HV-led HCP 0-5 service at the research site (and is a co-sponsor of this research), and the needs of HVs (the end-users of this intervention), identified from the analyses of the findings of the stage one and stage two workshops. The findings from stage one workshops revealed several modifiable HV-level barriers; importantly, the top four priority ranked barriers were HV-level barriers. Practitioner-focused interventions (to address HV-level barriers) identified by stage two workshop participants emphasised the need for obesity prevention training for HVs. DCC has identified supporting practitioners' professional practice development as an important objective in their whole system approach to address prevention of childhood obesity (212). These findings were discussed with my

supervisors, following which it was decided to develop an educational and training intervention targeting individual HV-level behaviour change. Therefore, the next step was to understand (1) how the contextually relevant HV-level barriers and facilitators (identified by participants of stage one workshops) influence HVs' practice behaviours; and (2) identify what needs to change, to support HVs' implementation of recommended practice behaviours (the behaviours of interest for this intervention).

Objective 3.2: Theoretical analysis of barriers (desk-based research)

Method

The HV-level barriers (reference Box 4.1) including HVs' beliefs and assumptions about parent-level factors were mapped to the sub-components of the COM-B model of behaviour. From this mapping exercise, I identified what changes in capability, opportunity, and motivation might be needed to potentially increase HVs' uptake of recommended practices.

Findings

The mapping of the barriers revealed that psychological capability, motivation (reflective and automatic), and opportunity (social and physical) were all potentially relevant drivers for HVs to perform the recommended practices. No barriers were mapped to the component "physical capability". The findings indicate that implementing recommended practices for prevention of excess weight in children is a complex phenomenon. This 'behavioural analysis' informed what needs to happen for the target behaviours to occur and what, in terms of capability, motivation and opportunity, needs to change. The findings of this analysis are shown in table 4.13, below.

Table 4.13. Mapping of the barriers to the domains of COM-B.

Potentially modifiable barriers (Barrier ID: reference Box 4.1)	Relevant COM-B components	What needs to happen at individual HV-level, for the target behaviours to occur
<ul style="list-style-type: none"> ●Lack of knowledge, skills, and confidence (P1) ●Lack of familiarity with guidelines/ guideline content (P2) 	Psychological capability	<ul style="list-style-type: none"> ●Understanding of the causes and consequences of rapid weight gain during infancy ●Having the knowledge and skills to tailor interventions and device strategies when required ●Having the confidence that they can perform the recommended practices even when experiencing parental resistance/ lack of interest
<ul style="list-style-type: none"> ●Uncertainty about identifying infants as overweight/obese (P5) ● Beliefs: Disagreement with guidelines/evidence underpinning the guidelines (P3) ●Belief: my advice does little to prevent childhood obesity (P4) 	Reflective motivation	<ul style="list-style-type: none"> ●Understanding of the consequences of delay in intervention to prevent rapid infant weight gain ●Having knowledge of the quality and strength of evidence underpinning guideline recommendation ●Believing that HVs’ preventive efforts have the potential to produce positive health outcomes for the child and family
<ul style="list-style-type: none"> ●Belief: preventing excess weight gain in young children is parents’ responsibility (P6) ●Belief: parents lack motivation to change (F2) ●Belief: Parents lack knowledge and parenting skills (F5) ●Parents misperceive heavier infants as healthier (F7) ●Belief: Harm to practitioner-parent relationship (P7) 	Reflective motivation Social Opportunity	<ul style="list-style-type: none"> ●Believing that motivating a parent who appears to be not concerned is part of their role ●Believing that providing parents with information, advice and support can help improve parents’ skills and confidence ●Believing that correcting parents’ misperceptions of healthy infant weight gain is part of their role ●Have the skills to manage parental resistance (actual or perceived) and sensitively engage with parents ●Believing that even if resistance is experienced, discussing the topic will influence the perception of parents (and potentially their practices) ●HVs having the skills and confidence to provide advice in a manner that does not threaten their existing relationship with the families

Potentially modifiable barriers (Barrier ID: reference Box 4.1)	Relevant COM-B components	What needs to happen at individual HV-level, for the target behaviours to occur
<ul style="list-style-type: none"> • HVs lack time and have many competing priorities to manage during their visits (O3) • HV lack tools and resources (O2) 	Physical opportunity	<ul style="list-style-type: none"> • HVs prioritising discussing weight related behaviours especially when assessment suggests increased risk of rapid infant weight gain • Having skills and tools (e.g., decision making, guideline summaries, prompts) to perform the behaviours quickly and efficiently
<ul style="list-style-type: none"> • Sensitive topic: fear of offending parents/provoking negative reactions from parents (angry, upset, tearful parents) (P8) 	Automatic motivation Social opportunity	<ul style="list-style-type: none"> • Adopting the position that obesity is a societal and environmental issue, whilst at the same time emphasising the importance of implementing practices that are known to promote healthy infant weight and prevent excessive weight gain • Feeling the need to change some existing practice routines: able to resist the instinct to avoid the topic (not wanting to 'rock the boat') • Recognising that it can be difficult for parents to initiate the topic because of the social stigma associated with obesity

Objective 3.3. Identify intervention functions (desk-based research)

Method

The next step in the BCW is to link the “behavioural analysis” with intervention functions that can address the relevant COM-B sub-components. The nine intervention functions identified in the BCW (218) are: education, persuasion, incentivisation, coercion, training, restriction, environmental restructuring, modelling, and enablement. An outline of the intervention functions is presented in Table 4.14. An intervention may have more than one function; e.g., an intervention that provides information about the consequences of delay in intervening to prevent excess weight gain in infants is educational but may also be persuasive because it can generate feelings of concern in the practitioner. The links between the COM-B model, the Theoretical Domains Framework (TDF) and intervention functions, identified by a group of experts in a consensus exercise served as a guide to select intervention functions likely to be effective in bringing about the desired change, based on the behavioural analysis (218).

Table 4.14 Intervention functions, as defined in the BCW (218).

Intervention function	Definition
Education	Increasing knowledge or understanding; e.g., provide information
Persuasion	Using communication to induce positive or negative feelings or stimulate action; e.g., use of imagery
Incentivisation	Creating an expectation of reward; e.g., financial incentives
Coercion	Creating an expectation of punishment or cost; e.g., use of social disapproval/ consider enacting legislation
Training	Imparting skills; e.g., advanced skills development training
Restriction	Using rules to increase the opportunity to engage in the target behaviours (or reduce the opportunity to engage in competing behaviours)
Environmental restriction	Changing the physical or social context; e.g., changing the social context by adding prompts to ask about infant feeding practices
Modelling	Providing an example for people to aspire to or imitate; e.g., using videos showing examples of good practice
Enablement	Increasing means/ reducing barriers to increase capability (beyond training and education) or opportunity (beyond environmental restructuring); e.g., self-monitoring, prompts and cues, problem solving, social support

The selection of the most appropriate intervention functions for the intervention was informed by the application of the APEASE criteria (**A**ffordability, **P**racticality, **E**ffectiveness and cost effectiveness, **A**ceptability, **S**ide effects/ safety and **E**quity) (summarised in Table 4.15, below), using guidance from the BCW (253), guidance from NICE (387), and discussion with my academic supervisors.

Table 4.15 The APEASE criteria for designing and evaluating interventions.

Criterion	Description
Affordability	Intervention development and implementation projects often have an implicit or explicit budget. An intervention is regarded as affordable if it can be delivered to (or accessed by) all for whom it is relevant or of benefit, within an acceptable budget. It is immaterial how effective the intervention may be if it cannot be afforded.
Practicability	An intervention is practicable to the extent that it can be delivered as designed to intended recipients using the resources that are available. An intervention that is delivered by highly trained staff with optimal resources may show high effectivity (e.g., in a pilot study) but in routine practice this may not be practicable.
Effectiveness and cost-effectiveness	If two interventions are equally effective, then the more cost-effective (ratio of effect to cost) one should be chosen. If one is more effective but less cost-effective than the other, then affordability and practicability become important criteria for decision making.
Acceptability	A key criterion is the extent to which an intervention is assessed to be appropriate by stakeholders. Acceptability may be assessed differently by different stakeholders.
Side effects/ safety	An intervention may be affordable, practicable, and effective but it can have unwanted side-effects or intended consequences. These need to be considered in advance.
Equity	An important consideration is the extent to which an intervention may decrease or increase the disparities in health and wellbeing between different groups within the target population.

A choice needed to be made about which intervention functions are most appropriate, and likely to be achievable, practical, and have potentially the best chance of success in bringing about change in the context of this research. The objective was to ensure that all the COM-B components that were identified in the behavioural analysis were targeted and that the selected intervention functions were achievable and practical. This involved an element of

subjective judgement but application of the APEASE criteria made the process explicit and transparent. The BCW also suggests identifying specific policy-related categories that are likely to be appropriate in supporting the selected intervention functions. This research focused on behaviour change at the level of the individual, and therefore, changing policy was judged as not relevant.

Findings

Using the BCW guide, I linked the COM-B components (identified from the behavioural analysis, shown in Table 4.13) to an initial list of potentially relevant intervention functions. This information is presented below in Table 4.16.

Table 4.16 Linking COM-B components to potentially useful intervention functions

COM-B	Intervention functions
Psychological capability	Education, Training, Persuasion, Enablement
Physical opportunity	Training; Environmental restructuring, Enablement
Social opportunity	Modelling, Environmental restructuring, Enablement
Reflective motivation	Education, Persuasion, Enablement, Incentivisation
Automatic motivation	Persuasion, Environment restructuring, Modelling, Training, Enablement, Incentivisation

Subsequently, I applied the APEASE criteria to select five intervention functions (Education, Training, Persuasion, Modelling, Enablement) that were judged to be affordable, practicable, potentially effective, and cost-effective, acceptable, safe, and equitable. The APEASE criteria findings and the rationale (in brief) for each intervention function are summarised in Table 4.17 (below); the detailed APEASE criteria rating of the different intervention functions is presented in Appendix Q.

Table 4.17 Use of the APEASE criteria to select appropriate intervention functions

Intervention function	Comments (detailed comments are presented in Appendix Q)
Education	<p>Most HVs have agreed with the need to increase their knowledge; it was considered as acceptable and practical. Educational interventions can be potentially effective in improving practice (388). However, sustained implementation of guidelines is unlikely to be implemented without further intervention support. Education is likely to be effective when factors related to the social context (parent/family factors) and the provider organisation (provision of tools and materials) are also addressed (210). Include: Yes</p>
Environmental restructuring	<p>HVs have highlighted lack of time and practice tools (these barriers linked to the domain “physical opportunity”); these barriers were also a frequent finding in the SR. In contrast, availability of time and practice tools were identified as facilitators in the SR. Environmental restructuring can positively influence (i) physical opportunity (e.g., introducing more mandated visits, allowing HVs more time for consultations, addressing HVs’ caseloads by managing staffing issues, providing time-saving practice tools, providing prompts and reminders); and (ii) social opportunity (e.g., introducing new national-level recommendations for HVs and other PCPs to identify overweight in 0-2 year olds; introducing care pathways, to enable a nationally consistent coherent approach). The findings of the workshops and the SR strongly suggest that targeting organisational-level barriers is key to support health professionals’ role in prevention of childhood obesity. These findings are also reported in the wider literature (209, 280, 389). However, it was beyond the scope of this research to address the organisational-level barriers, with the aim to bring about structural changes in the physical and social environment of HVs’ practice. Therefore, it was decided to not include this intervention function. Include: No</p>
Modelling: included	<p>The findings from stage two workshops suggested that modelling (demonstration of the behaviour) as an intervention function was considered important and useful by participants. Include: Yes</p>

Intervention function	Comments (detailed comments are presented in Appendix Q)
Training	<p>Training for skills development was considered by all HVs as a priority need. Similar to education, implementation of skills into routine practice will require organisational support. Delivery of training in skills related to certain practice behaviours (e.g., assessing and communicating risk of overweight, motivation for change) may be limited by lack of standardised tools (existing guidelines do not recommend any specific tools).</p> <p>Include: Yes.</p>
Persuasion	<p>Findings from stage one and two workshops indicated that HVs' are uncertain about addressing overweight prevention during early life and have to manage several competing role related priorities. Persuasion regarding the importance of early intervention was deemed as an important intervention function.</p> <p>Include: Yes</p>
Enablement	<p>The findings from the workshops and the evidence from literature indicated that increasing HVs' capability (skills) and opportunity (e.g., training for planning of the behaviours in advance and use of self-designed prompts and reminders) by reducing barriers is acceptable, affordable and is likely to be effective if existing barriers at individual HV level are addressed.</p> <p>Include: Yes</p>
Incentivisation	<p>Financial incentivisation for increasing compliance with recommended practices was judged as impracticable and not acceptable, in view of the sensitive nature of the topic and the universal nature of core health visiting services. However, a non-financial incentive (such as providing continuing professional development points) to staff for participation was deemed to be affordable, practicable and acceptable.</p> <p>Include: No</p>

The selected intervention functions were assessed as potentially capable of addressing the COM-B components that represent the changes required at individual HV-level, as outlined in Table 4.18.

Table 4.18 Intervention functions deemed relevant for the intervention

Intervention function	Linked COM-B component(s)	Example
Education	Psychological capability	Educate to increase familiarity with guideline recommendations
	Motivation (reflective)	Educate to create more positive beliefs, e.g., provide information on benefits of practitioner-led early prevention interventions
Training	Psychological capability	Train to develop cognitive and social skills required to successfully perform the practice behaviours
	Motivation (automatic)	Train to strengthen the habit of performing the desired behaviour and avoid undesired behaviours
	Physical opportunity	Train to perform the recommended practices quickly and efficiently, thereby reduce time demand;
Persuasion	Motivation (reflective)	Create positive beliefs about the behaviour (e.g., refer to the credibility of the guidelines by discussing the strength of the evidence underpinning them)
	Motivation (automatic)	Induce positive feelings about the behaviour to motivate HVs to perform the behaviours (e.g., discuss case stories)
Modelling	Motivation (reflective)	Model desired behaviour(s) for HVs to feel positively about the behaviour(s) (e.g., showing video of staff providing obesity prevention advice in a confident, assured manner)
	Motivation (automatic)	Model desired behaviour to induce positive feelings about the behaviour (e.g., showing video of staff interacting with parents that minimises potential offense and embarrassment)
	Social opportunity	Model desired behaviour to shape HVs' thinking (showing video of good practice around communication on weight issues)
Enablement	Social opportunity	Shape HV's thinking about performing the behaviour (e.g., suggesting that providing advice to parents who are overweight is particularly important given greater difficulties for parents to raise the topic, due to the stigma associated with obesity)
	Psychological capability	Support HVs' decision-making processes (e.g., rapid decision-making support tools)
	Automatic motivation	Enable HVs to habitually engage with the behaviour (e.g., work with HVs to identify action planning and problem-solving strategies)

Objective 3.4. Identify intervention content (BCTs)

This objective was completed in two steps that were carried out sequentially:

Step 1: Identify an initial list of potentially relevant BCTs and operationalise them

Step 2: Select BCTs that are rated important and acceptable in the local context

In the following sections, the methods used within each step are first described, followed by the findings (outputs) from that step.

Methods

Step 1: Identify an initial list of potentially relevant BCTs (desk-based research)

In the BCW literature, the contents of a behaviour change intervention refer to the BCTs used in it. BCTs are hypothesised to produce a change in behaviour by acting upon causal processes (e.g., knowledge, skills, beliefs about consequences) which change as a result of the BCT; these changes in causal processes are expected to facilitate a change in behaviour (390). For example, it is hypothesised that the BCT 'Graded Task' (defined as 'set easy-to-perform tasks, making them increasingly difficult, but achievable, until behaviour is performed') might change behaviour by increasing beliefs about one's capabilities and motivation. Different BCTs are grouped into domains based on how they work in the BCT taxonomy v1(262). In this taxonomy, there are a total of 93 BCTs within 16 groupings. For each BCT, the taxonomy provides a specific agreed label, definition, and an example of how it can be used. The BCW provides guidance on the links between intervention functions and BCTs. Some BCTs can serve more than one intervention function. For example, the BCT 'adding objects to the environment' could be linked to the enablement function but also the environmental restructuring function, depending on the nature of the object and the context in which it was delivered.

An initial list of potentially relevant BCTs was prepared by me, informed by guidance from the BCW literature (specifically, BCTs that are most frequently used by the selected intervention functions were considered) (218), evidence from the literature on the hypothesised links between BCTs and behavioural determinants (391-393), findings of the recently completed systematic review, and findings from the data generated from stage one and stage two workshops. Next, the BCTs were operationalised: namely, the individual BCTs were translated from their taxonomy definition into what it would look like as a feature or

application within the intervention. The operationalisation of the different BCTs was informed by the definitions of the BCTs in the BCT taxonomy (262) and literature on BCT-based behaviour change communication training interventions aimed at practitioners (208, 394-396). This list of operationalised BCTs (the intervention 'components') served as an input for the next step.

Step 2: Select BCTs that are acceptable in the local context (workshop activity)

The final selection of the BCTs for the intervention was based on what was perceived as locally relevant, likely to be acceptable and could be delivered within an intervention. Three stage three workshops were held (on 12/8/2019, 14/8/2019, and 21/8/2019, respectively) in which HVs from three teams (teams A, E and D, one team per workshop) took part. Whilst teams A and D had taken part in earlier workshops, Team E was participating for the first time. Workshop participants individually rated the operationalised versions of 19 BCTs for their level of importance and acceptability in the local context. To facilitate this process, the names, and brief descriptions of the BCTs were presented on cards (1 item per card) alongside two questions (how important do you think X is and how acceptable is X to you?) and correspondingly, two rows of five boxes each for rating. Participants rated each item on the two dimensions of interest by placing a sticky dot on the box of their choice on each row (for importance, 1 = not important, 2= slightly important, 3=moderately important, 4= important, 5=very important; for acceptability, 1= not acceptable, 2= low acceptability, 3= slightly acceptable, 4= acceptable, 5= perfectly acceptable). Illustrations of the cards that were used at the workshops are presented in Appendix R. The number of sticky dots assigned to boxes 1 and 2 on the rows for importance and acceptability for each item were tallied to determine the number of participants who rated the item as 'less important' and 'less acceptable', respectively; the number of sticky dots assigned to the boxes 3, 4 and 5 were tallied to determine the number of participants who rated the item as 'more important' and 'more acceptable', respectively. BCTs that were rated as 'more important' and 'more acceptable' by majority of participants were selected in the final list of the BCTs.

Taking into consideration the relatively small sample size of stage three workshops (a total of 26 HVs took part in the three workshops) and HVs' emphasis on including intervention features that are known to help with improving skills, additional input was sought from participants in stage four workshops, prior to finalising the list of BCTs for the intervention.

Five BCTs (they were selected because they are frequently used for 'skills development' in training interventions) were presented also to participants of the first stage four workshop (participants were HVs from team C) for rating of their importance and acceptability in the local context. Participants in stage three and four workshops also engaged in group discussions and expressed their views about topics that could be covered within an interactive face-to-face training intervention and preferred learning methods.

Findings

Step 1: Identification of an initial list of potentially relevant BCTs

Informed by the BCW literature and other relevant literature, I identified an initial list of 25 BCTs matched to the five intervention functions that were selected for the intervention. The BCT taxonomy and literature on effectiveness of BCTs do not incorporate issues of feasibility and acceptability of BCTs. Of the initial list of 25 matched BCTs, I selected 18 BCTs that were assessed by me as potentially relevant for the intervention. My subjective decisions for selecting these 18 BCTs were informed by the findings of the recently completed systematic review (in particular, facilitators of implementation), findings of stage one and two workshops, and published literature on BCT-based obesity prevention training interventions for healthcare practitioners (204, 397). The rationale for selecting those 18 BCTs is described in detail and presented in Appendix S.

I assessed the other seven BCTs as either not practicable or suitable in context, or likely to be rejected by HVs. My assumption was that including these BCTs may adversely affect the acceptability of the intervention. My subjective decisions to exclude the seven BCTs was informed by literature on the context and public health practice of health visiting (171) and HVs' practice environment (152), evidence from literature on development of implementation interventions (255, 398), and informal discussions with HV team leaders. The details of this subjective assessment are summarised in table 4.19.

Table 4.19 Details of the BCTs not included for consideration in the intervention.

BCT name	Description of the BCT	Reason(s) for assessing BCT as not practicable or acceptable as a behaviour change strategy
Goal setting (behaviour) (1.1)	Prompt HVs to set or agree on a goal to perform the practice behaviour	Having specific goals (e.g., assessing child's weight and discussing findings with parents during visits) as opposed to preventive care goals that HVs already have for children and families is likely to elicit responses ranging from contentious to unacceptable from HVs. Evidence from HV literature suggests that goals that allow measurement of compliance or comparison of performance between individual HVs are likely to be unacceptable (173, 181); also, currently, there is no national requirement for HVs to identify 0-2-year-olds who may be overweight (153).
Commitment (1.9)	Ask HVs to affirm or reaffirm statements indicating commitment to change the behaviour	Not considered practical to ask HVs to commit to a specific task (for e.g., weight and length assessment) at every mandated visit; although some HVs may affirm this, HVs have emphasised they face many competing demands (largely determined by organisational priorities) for their time (308). Also, currently, there is no national requirement for HVs to identify 0-2-year-olds who are overweight (153). HVs are expected to use their professional judgement when deciding whether to record an infant/toddler's weight; asking HVs to make a commitment to specific tasks may in fact cause a sense of failure if HVs do not or cannot act upon their commitment.
Feedback on behaviour (2.2)	A peer (or supervisor) monitors and provides feedback on performance of the practice behaviour	Many relevant behaviours take place at client's home; resource constraints (staffing and workload pressure) mean that it will not be feasible for peer/supervisor to mutually agree to monitor and provide feedback on individual HV's practice behaviours. Feedback from parents/carers about experiences of care provided by HVs can provide valuable information about HV-delivered care and could be considered as a data source in a future study to evaluate the effects of the intervention (399).
Self-monitoring of the behaviour (2.3)	Establish a method for HVs to monitor their performance of the recommended practice behaviours	HVs already document the tasks they perform during their contacts with children and families using prescribed forms. Self-monitoring of behaviour when combined with goal setting, feedback on behaviour, and monitoring of behaviour have been used with increased intervention effects to support healthy lifestyle behaviours (400, 401). Nonetheless, in the current policy and practice environment of HVs' professional work, this BCT was not considered as a practical strategy for professional behaviour change because: (1) currently, there is no national requirement for HVs to identify 0-2-year-olds who are overweight (153); (2) HVs are recommended to use their professional clinical judgement when making decisions about frequency of weighing infants and intervening. Therefore, this BCT is unlikely to motivate HVs in the absence of an initiative from their employer organisation. Information routinely collected by HVs could be a useful data source in a future study to evaluate the intervention rather than as a behaviour change strategy.

BCT name	Description of the BCT	Reason(s) for assessing BCT as not practicable or acceptable as a behaviour change strategy
Self-monitoring of outcomes of the behaviour (2.4)	Establish a method for HVs to monitor the outcomes of their performance of the recommended practice behaviours	HVs already record the outcomes of the tasks that they perform during their contacts with children and families, as mandated by their employer organisation. This BCT was not considered for inclusion as a behaviour change strategy because of reasons stated above for BCT 2.3; information routinely collected by HVs could be a useful data source in a future study, but to evaluate the intervention rather than as a behaviour change strategy.
Feedback on the outcomes of the behaviour (2.7)	A peer (or supervisor) monitors and provides feedback on the outcome(s) of the behavior	Not considered as practical for reasons stated above for BCT 2.2
Mental rehearsal of successful performance (15.2)	Advise HVs to practise imagining performing the behaviour successfully in relevant contexts	Not considered as practical; the behaviours addressed by this intervention are too complex to meaningfully imagine performing them

Step 2. Selection of BCTs that are more likely be acceptable in the local context.

Eighteen BCTs were rated by twenty-six HVs (stage three workshop participants: ten, six, and ten, from HV teams A, E, and D, respectively) for their perceived importance and acceptability in the local context. Five BCTs (from the list of the 18 BCTs) were further rated by twenty HVs (first stage four workshop participants: HV team C). The results of the rating of the BCTs are presented in two tables. Table 4.20 shows the rating information of 13 BCTs that were rated only by stage three workshop participants; the rating information of the five BCTs that were rated by participants of stage three workshops and also by participants of the first stage four workshop is shown in Table 4.21 (following page).

Table 4.20 Findings of the rating of importance and acceptability of 13 BCTs by stage three participants (n=26); the BCTs (with labels from the BCT taxonomy v1) are listed in this table in an ascending numerical order.

Name of the BCT (BCT label); linked Intervention function(s)	% (rounded value) of HVs (n=26) who rated the BCT				Decision to select BCT (based on HVs' input and APEASE criteria)
	Importance		Acceptability		
	Low	High	Low	High	
Discrepancy between current behaviour and expected practice (1.6); (Persuasion, Enablement)	8	92	8	92	Yes , HVs are keen to know about gaps in evidence-based practice
Social support (practical) (3.2): use opportunities to share experiences and provide practical help (from colleagues); (Enablement)	8	92	8	92	Yes , HVs suggested routine monthly staff meetings could be used to facilitate peer social support
Instructions on how to perform the behaviour (4.1); (Training)	4	96	4	96	Yes , HVs value skills training
Provide information about health consequences (5.1); (Education)	0	100	0	100	Yes , HVs want updated information on early childhood obesity
Saliency of consequences (5.2): emphasise the consequences of intervening early (and delay in intervention); (Persuasion)	8	92	12	88	Yes , HVs are keen to explore and learn about the benefits of early prevention
Social comparison (6.2): provide information on positive outcomes of trained nurse-led prevention interventions (Persuasion)	4	96	8	92	Yes , HVs want to know more about the role of practitioners in prevention of excess weight gain during early years
Information about others' approval (6.3): provide information about what other people think about the behaviour (Persuasion)	0	100	0	100	Yes , HVs want to know about families' expressed need for care and their experiences of receiving preventive care
Prompts, cues (7.1): discuss the role and use of self-designed prompts; (Enablement)	15	85	15	85	Yes , HVs believe prompts are helpful and have expressed support to discuss their use
Credible source (9.1): present information from a credible source; (Persuasion)	1	100	0	100	Yes , this feature is highly desirable by all HVs

Name of the BCT (BCT label); linked Intervention function(s)	% (rounded value) of HVs (n=26) who rated the BCT				Decision to select BCT (based on HVs' input and APEASE criteria)
	Importance		Acceptability		
	Low	High	Low	High	
Adding objects to the environment (12.5): providing HVs with a training manual and tools (e.g., self-designed reminders) they can use; (Enablement)	4	96	0	100	Yes , HVs have identified this as a highly desirable feature
Framing/reframing (13.2): suggest the deliberate adoption of a new perspective, to change cognitions and/or emotions about the phenomenon; (Persuasion, Enablement)	23	77	8	92	Yes , HVs believe that re-framing obesity (e.g., focus on health and not on weight) is the right approach and helps in engaging with parents
Verbal persuasion of capability (15.1): tell the person (in a credible way) that they can successfully perform the behaviour (Persuasion, Enablement)	23	77	27	73	Yes , HVs value interaction and constructive feedback
Focus on past success (15.3): reflection on practice and discuss past successes; (Enablement)	0	100	4	96	Yes , HVs value the opportunity to reflect on own practice

Table 4.21 Findings of the rating of importance and acceptability of five BCTs by participants of all three stage three workshops (n=26) and one stage four workshop (n=20).

Name of the BCT (BCT label) (Intervention function)	% (rounded value) of HVs (n=46) who rated the BCT				Decision to select BCT (based on HVs' input and APEASE criteria)
	Importance		Acceptability		
	Low	High	Low	High	
Problem solving (1.2): analyse factors that help/hinder the performance of the behaviour and then devise solutions (Training, Enablement)	22	78	11	89	Yes , there is support from HVs for activities that can help with skills development
Action Planning (1.4): plan how they will go about performing behaviours they consider are difficult/complex; (Enablement)	11	89	6	94	Yes , HVs are keen to learn about how to plan in advance practice behaviours they find challenging to implement
Demonstration of the behaviour (6.1): provide sample of the performance of the behaviour; (Training, Modelling)	26	74	13	87	Yes , HVs want to see examples of best practice
Behavioural practice/rehearsal (8.1): practice performance of the behaviour (Training)	59	41	83	17	No , majority of HVs did not accept this BCT (operationalised as Role Play)
Graded tasks (8.7): Set easy-to-perform tasks, making them increasingly difficult, but achievable, until behavior is performed (Training, Enablement)	37	63	35	65	Yes , there is support from HVs for this BCT linked to skills development

All proposed BCTs were rated as important and acceptable by majority of workshop participants except for the BCT ‘Behavioural Practice/Rehearsal’ (BCT 8.1) which was given low rating for both importance and acceptability. This BCT which was operationalised as “Role Play” for the rating activity is considered as an effective BCT for development of skills and enhancing beliefs about capability (402). Majority of participants of all three stage three workshops and the first stage four workshop expressed reservations about Role Play. In view of this, various ‘modified’ forms of ‘Role Play’ that have been suggested in the literature (403, 404) as possible alternatives to ‘traditional’ Role Play were presented to participants at two stage four workshops (eight HVs from team E and six HVs from Team B, respectively) for acceptability rating. The findings are summarised in table 4.22, below.

Table 4.22 Rating of acceptability for alternatives for the BCT ‘Rehearsal of the behaviour’

Description of the activity	% of HVs (n=14) who rated the activity's acceptability		Comments
	Low	Moderate to high	
Trainer and assistant perform a scenario; the trainer deliberately but in a subtle way demonstrates non-attentive body language/ failure to listen or show empathy; participants are asked to suggest improvements, when ready, they shout ‘Freeze Frame’	0	100	Acceptable; however, HVs agreed that this activity was a modification of ‘demonstration of the behaviour’ and was not “Role Play”
“Reverse role play”: HVs perform the role of the parent with “professional” role players who perform the HV’s role	100	0	HVs’ view was that the proposed activity lacks authenticity and will be costly
‘Modified’ Role play: Participants practice skills with peers (who they know well) in groups of three in private, using scenarios from actual practice experiences after observing trainer and assistant perform a scenario	61.5	38.5	This activity emerged as the most acceptable option for a modified form of ‘Role Play’ but fell short of a majority ‘vote’

As shown in Table 4.22, a minority of participants (38.5%) asserted that they could consider a modified form of “Role Play” where participants are asked to ‘practice skills with peers they know well, in groups of three, and shielded from the other participants, after observing the trainer/facilitator and assistant perform a scenario’. Several themes emerged from HVs’ group discussions regarding their expectations about the elements of a training intervention. The analyses suggested that participants value activities that can help them build their knowledge and skills. Participants’ low rating for acceptability of the BCT “Rehearsal of the

behaviour” was reflected in the analyses of the qualitative data. HVs asserted they prefer interactive group learning methods (as opposed to didactic teaching methods) but did not ‘like’ Role Play. The themes along with supporting verbatim extracts from participants’ data are summarised below in Table 4.23. A photograph of examples of cards showing HVs’ views is attached (see Figure 4.10).

Table 4.23 Participants’ views of intervention contents and learning methods.

Themes	Subthemes with select verbatim extracts from participants’ data
Preferred learning methods	<ul style="list-style-type: none"> •Variety of learning methods: less didactic and more interactive learning <i>“Alternative options for learning - some videos, some kind of group based, things...because we all learn differently, mixed ways rather than just lectures...”</i>
	<ul style="list-style-type: none"> •Reluctance for “Rehearsal of the behaviour/Role Play” but welcome other interactive group-based skills practice <i>“I’m not a big role-play person but things like, give us an activity in a group, do like different ages, different scenarios”</i> <i>“...if you’re with your peers and you’re all in small groups of three and you’re given a scenario then that’s fine. I hate role-play but that would be fine for me”</i>
Desired topics for the intervention	<ul style="list-style-type: none"> •Updated and reliable information (Credible source) <i>“...the content needs to be evidence based, contemporary information”</i>
	<ul style="list-style-type: none"> •Knowledge that can be readily applied to inform practice <i>“We want to be able to take the information and translate it so we can use it ready to deliver to the families”</i> <i>“Knowing that you’ll come out with the relevant information that will support you in your current practice”</i>
	<ul style="list-style-type: none"> •Knowledge about obesity prevention <i>“...how we could deliver the interventions in a timely manner...and the evidence based behind that and what sort of works well for some families doesn’t work well for others...”</i> •Knowledge about parents’ experiences of receiving care <i>“Feedback from parents...perhaps a video where parents have already had discussions about how they felt it went, that might be quite good.”</i>
	<ul style="list-style-type: none"> •Training to build up on skills <i>“user-friendly ways of working, how we could incorporate those processes in our day-to-day work in a time limited visit”</i> <i>“Prioritising your workload, time management skills, it’s all of those things you need...it’s about a process”</i>

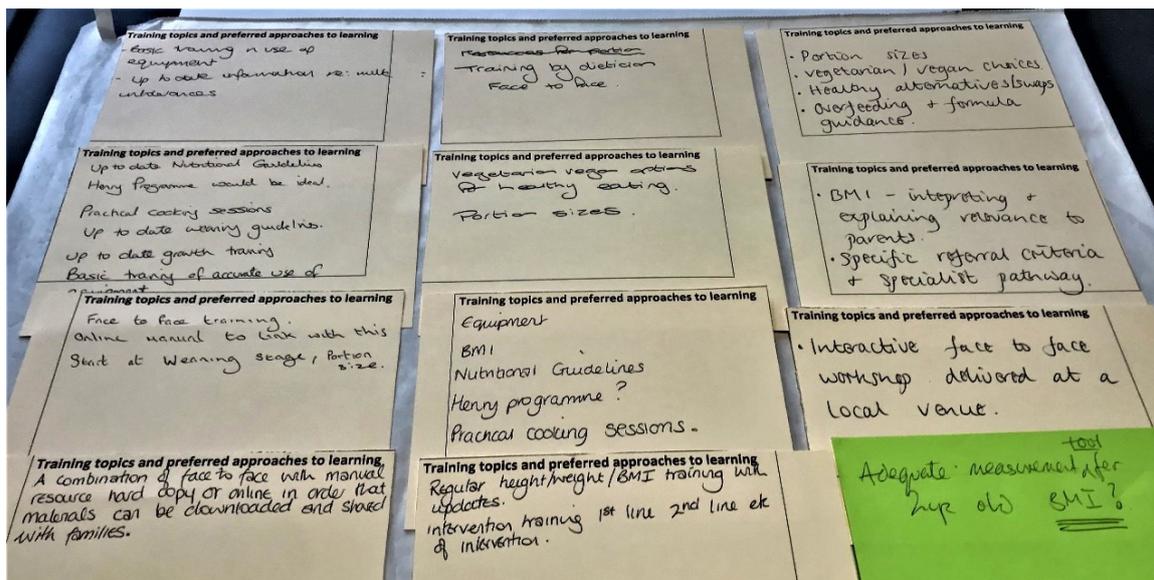


Figure 4.10. Examples of cards showing participants' views on intervention content and preferred learning methods.

Post workshop analysis

The BCT 'Behavioural practice/rehearsal' (operationalised as 'Role Play') was excluded from the list, based on the analysis of the data from the workshops. Challenges of including 'Role Play' as a component in communication skills trainings have been reported by practitioners and educators (405), and medical students (406). They include the lack of authenticity of an enacted scenario and the potential difficulties in interpreting the professional skills level of participants, due to variation in acting skills of participants. The 17 BCTs selected for this intervention serve several intervention functions and target a range of behavioural processes that were identified as relevant targets for the intervention from the theoretical analysis of HV-level determinants. They are: psychological capability (knowledge and skills), reflective motivation (attitudes toward the behaviour, beliefs about capability and consequences), automatic motivation (impulses and habits), social opportunity (social norms, interpersonal influences), and physical opportunity (availability of time). The links between the specific HV-level barriers, relevant COM-B domains and the selected BCTs (and their operationalised versions) are shown in Table 4.24 (pages 154-156) alongside the intervening functions they serve. For example, the BCT "provide information about health consequences" (BCT 5.1) was selected to serve the intervention function of education and addresses psychological capability and reflection motivation (e.g., changing beliefs about guidelines and the value of HV-led prevention intervention efforts).

Table 4.24 Summary of HV-level barriers, intervention functions, selected BCTs and their operationalisation; barriers are tagged with labels previously assigned to them (see Box 4.1); barriers are listed in order of Capability, Opportunity, Motivation.

HV-level modifiable barriers (Barrier ID)	COM-B component	Intervention function	BCT label and name	Intervention components: operationalisation of the BCT within the intervention
Lack of knowledge of childhood obesity (P1) Lack of familiarity with guidelines (P2) Skills (cognitive and interpersonal) for performing the practice behaviours (P1)	Psychological capability (Knowledge)	Education	5.1 Information about health consequences	Provide information on excess and rapid weight gain in 0-2 year olds (risk factors and health consequences); early prevention interventions; present and discuss guidelines
		Persuasion		
		Enablement	12.5 Adding objects to the environment	Provide HVs with educational materials (part of a training pack) (e.g., copies of slides used in the session, key published papers, links to websites)
	Psychological capability (Skills)	Training	4.1 Instruction on how to perform a behaviour	Provide training manual; provide information about resources (web-based and key published papers) on best practice techniques
		Modelling	6.1 Demonstration of the behaviour	Show video clips of good communication with parents on healthy weight; group discussions to include awareness/recognition of best practice and empathic communication techniques
		Enablement	1.4 Action planning	HVs discuss what changes they should and can implement in their practice routines and how they will go about it; support HVs to generate their own plans to implement practices they perceive as particularly challenging
Lack of time/ competing priorities (O3)	Physical opportunity		1.2 Problem-solving	HVs identify their own barriers to implement recommended clinical behaviours; HVs then work in groups to identify their own solutions to those barriers, which will enable them to perform the clinical behaviours; HVs write down their own 'if-then' coping plans to manage barriers
			8.7 Graded tasks	Working in groups of 2 or 3, HVs first set easy-to-perform tasks and then proceed to increasingly challenging but achievable tasks until they perform the practice behaviour in a challenging situation
	Psychological capability (Decision making)	Training	7.1 Prompts and cues	Prompt HVs to discuss (1) using service delivery prompts as reminders; (2) strategies that can help to reduce time demand and/or competing time demands;
		Enablement	12.5 Adding objects to the environment	Work with HVs to explore potential for designing reminders by adapting existing NHS resources (e.g., 'Ready to Relate' cards, a visual tool for practitioners designed to improve guideline implementation) (407)

HV-level modifiable barriers (Barrier ID)	COM-B component	Intervention function	BCT label and name	Intervention components: operationalisation of the BCT within the intervention
<p>Belief: parents lack interest, motivation, and skills (F2)</p> <p>Belief: preventing excess weight gain in young children is parents' responsibility (P6)</p> <p>Belief: Parents perceive heavier infants as healthier (F7)</p>	<p>Social opportunity (Social influences);</p> <p>Reflective motivation (Professional role and identity)</p>	<p>Education</p> <p>Persuasion</p>	<p>6.3 Information about other's approval</p> <p>6.2 Social comparison</p>	<p>Provide HVs with information (UK literature) on parents' expressed need for support from providers and parents' preferences for how weight related information is communicated; suggest that raising the topic of child's weight is particularly important given greater difficulties for parents to initiate the topic because of the social stigma of obesity; suggest that, even if resistance is experienced, discussing the topic will influence the perception of parents (and potentially their practices)</p> <p>Provide information (citing UK and other relevant literature) on (1) positive outcomes of trained primary care provider (PCP)-led prevention interventions; (2) PCP's role in motivating parents and correcting misperceptions on healthy weight gain in infants</p>
<p>Disagreement with evidence underpinning the guidelines (P3)</p> <p>Uncertainty about identifying infants as overweight/obese (P5)</p>	<p>Reflective motivation (Professional role, Intention)</p>	<p>Education</p> <p>Enablement</p>	<p>9.1 Credible source</p> <p>12.5 Adding objects to the environment</p> <p>1.6 Discrepancy between current and expected behaviour</p>	<p>Inform HVs about the credibility of the evidence underpinning the guidelines</p> <p>Provide HVs with educational materials (part of a training pack) (e.g., key published papers, links to websites)</p> <p>Provide information (UK literature) of gaps in evidence-based practices; draw attention to the link between recommended practices and two high impact areas of health visiting (infant nutrition, healthy weight); discuss implications of practice gaps</p>
<p>Low confidence in successfully performing the behaviours (P1)</p>	<p>Reflective motivation (Beliefs about capabilities)</p>	<p>Modelling</p> <p>Persuasion</p>	<p>6.1 Demonstration of the behaviour</p> <p>15.3 Focus on past success</p>	<p>Show video clips of good communication around raising the topic of weight and discussing weight related topics with parents</p> <p>HVs (individually and/in groups of 2-3) reflect on personal experiences of positive and negative weight-related communication in practice; prompt HVs to consider how their existing beliefs impact on their attitudes and intention to perform the behaviours</p>
<p>Belief: my advice/ intervention does little to prevent childhood obesity (P4)</p>	<p>Reflective motivation (Beliefs about consequences)</p>		<p>15.1 Verbal persuasion of capability</p> <p>5.1 Information about health consequences</p> <p>5.2 Salience of consequences</p>	<p>Facilitator provides constructive feedback, links feedback with HV's ability to provide guidance in real life settings, and counters any doubts with credible arguments</p> <p>Provide information (UK and other relevant literature) on improved outcomes of health professional-led early prevention interventions</p> <p>Present and discuss motivational videos, testimonials, and success stories (health visiting Case Studies)</p>

HV-level modifiable barriers (Barrier ID)	COM-B component	Intervention function	BCT label and name	Intervention components: operationalisation of the BCT within the intervention
<p>Fear of negative reactions from parents (P8)</p> <p>Concerns about harm to relationship with parents/ family (P7)</p>	Automatic motivation (impulses, habits); Social opportunity (social influences)	<p>Modelling</p> <p>Enablement</p>	<p>6.1 Demonstration of the behaviour</p> <p>13.2 Framing/reframing</p> <p>3.2 Social support – practical</p>	<p>Show video clips of sensitive communications with parents that minimise potential offence and embarrassment</p> <p>Reframe discussing weight issues as meeting child/ parent’s needs (focus on child’s health and not on weight); emphasise the role of the ‘obesogenic’ environment</p> <p>Suggest that raising the topic of child’s weight is particularly important given greater difficulties for parents to initiate the topic because of the social stigma of obesity</p> <p>Encourage HVs to use staff meetings to offer their peers and colleagues moral support, positive interaction, sharing and comparison</p>

Objective 3.5: Specify form of delivery of the intervention (informed by workshop activity)

Method

A plan was developed to “package together” the selected BCTs into a cohesive intervention that could be practically delivered. The form of delivery (FoD) of an intervention refers to the way the operationalised forms of BCTs (the components of the intervention) are delivered to the recipients of the intervention (371). The FoD for this intervention was informed by evidence from literature on complex interventions for healthcare practitioners to improve guideline implementation (255, 388, 408, 409) and HVs’ views, obtained from group discussions held at stage three and stage four workshops. HVs were asked about their views of the qualities of the trainer(s) and factors that were likely to increase participation and enhance HV’s experience of participation. The “template for intervention description and replication (TIDieR)” checklist and guidance is recommended for describing and reporting a developed intervention (410). This template was used to create a broad outline of the intervention including the components to be delivered, to whom and by whom, by what form of delivery and how often.

Findings

Twenty HVs from two teams (10 HVs from teams A and D, respectively) from stage three workshops and 34 HVs (twenty, eight, and six from teams C, E, and B respectively) from stage four workshops expressed their views about the delivery of the intervention. These views related to the qualities of the intervention facilitator and factors that would enable HVs to participate in the intervention and enhance their experience of participation. The emergent themes along with supporting extracts from participants’ data are summarised in Table 4.25. Photographs of charts showing extracts from participants’ notes are attached (Figure 4.11).

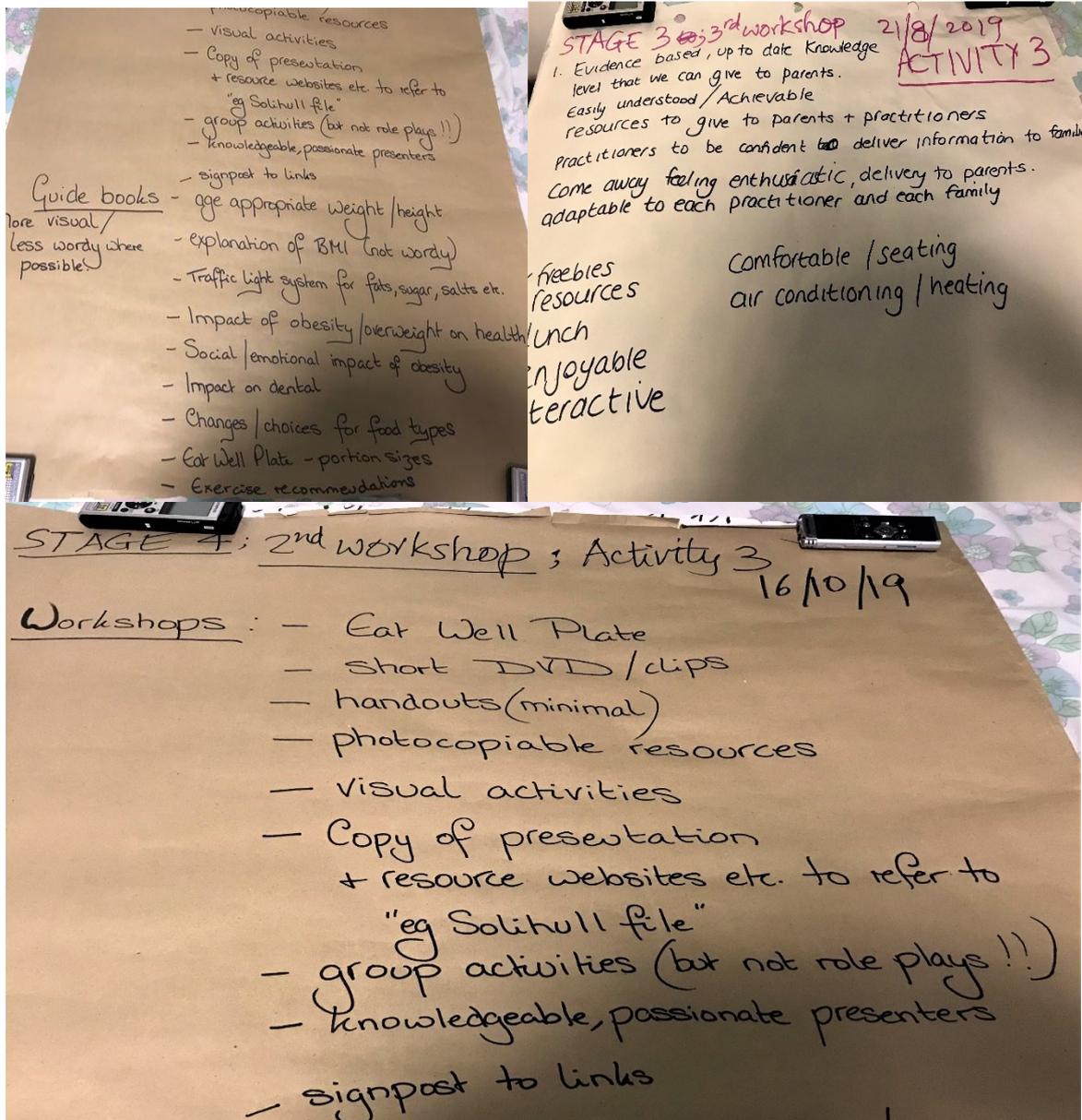


Figure 4.11. Excerpts from participants' notes on form of delivery of the intervention.

Table 4.25 Participants' views about the delivery of the intervention

Themes and subthemes with supporting extracts from participants' data	
Intervention delivery venue	<ul style="list-style-type: none"> • Adequate facilities, ease of access, provision of lunch and refreshments <i>"And we want the environment to be somewhere local, appropriate environment with a car park, good lighting, and heat control so it wouldn't be too cold or too hot, the IT (audio-visual media) to be right, so you can clearly see it so people aren't having issues with that. And free lunch"</i>
Qualities of the intervention facilitator	<ul style="list-style-type: none"> • Experienced qualified trainer knowledgeable in infant nutrition <i>"We want a qualified trainer, so somebody like a dietician or a specialist in the area...somebody that's really engaging and a specialist in the under 2s"</i> • Understands the role of the Health Visitor • Encourages interaction and engages with audience • Motivational, enthusiastic, good communicator, approachable, welcoming <i>"We need to come away feeling motivated, that it's been a purposeful use of valuable time, staff needs to feel engaged by the trainer"</i> • Ability to deliver well-structured sessions in timely fashion <i>"a well-structured session and some ground rules to keep everyone focused"</i>
Facilitators of participation	<ul style="list-style-type: none"> • Recognition of attendance (CPD points) <i>"We want recognition of attendance - for personal development"</i> • Caseload cover for HVs, to enable participation <i>"We would want case load cover"</i> • Promotion and raising awareness of the intervention • Timely sessions across the different areas to keep momentum • Social support for participants (provided by peers) <i>"Peer support...regular discussions at team meetings – how did that go, how was the training?"</i> • Consistent delivery of the intervention across different location-based HV teams <i>"...we would like it somewhere local to us so it's no good it being somewhere down (far away)"</i> • All staff are given the opportunity to participate <i>"it's really important for managers to attend"</i>

HVs described materials they would like to be included in the training pack (in addition to a printed training pack). These included materials for HV's own use and materials they could provide to parents; they are summarised below.

Materials suggested by HVs for their own use:

- Training handout, copies of slides
- Summaries of guidelines and protocols, pathways of care
- Tools for decision making (e.g., flow charts)
- Practice tools (e.g., colour coded BMI charts, communication aids)
- Information about apps, Public Health England resources, and relevant YouTube links

Materials suggested by HVs to offer to parents:

- Printed leaflets: health promoting messages for parents of 0-2 year olds
- Parent-friendly height and weight chart for boys and girls (different ages)
- Educational materials for parents to inform about BMI
- Parent-friendly educational materials (suggested source: First Steps Nutrition Trust)
- Links to YouTube videos (helpful for parents with learning difficulties)
- Materials that HVs could offer to parents (giveaways) such as sets of plastic foods, plates, bowls to help parents know and select correct portion size

The findings from the HV group discussions informed several recommendations with regard to the delivery of the intervention:

1. The intervention should be delivered at multiple venues on a team-by-team basis, to facilitate participation from each location-based HV team within County Durham.
2. The number of participants is limited to around 12 per intervention session.
3. All members of the health visiting team (including service managers) are invited to take part in the intervention.
4. Participation should be rewarded with CPD points (incentivised training).
5. The intervention should include provision of practice tools (these can be included as part of the training pack) to support HVs' implementation of practice.
6. During the roll out of the intervention, HV staff meetings should provide the opportunity for HVs share their experiences of taking part in the intervention and impact on practice.

Post workshop analysis

The outputs from objectives 3.4 and 3.5 were combined to identify and specify the components and features of the intervention and the form of delivery. The delivery mode of a face-to-face interactive workshop was selected because interactive education and skills development training is familiar to HVs and the evidence from literature (204, 397) suggests that training interventions delivered through interactive workshops have the potential to change practitioners' behaviours. Further, the workshop findings indicated that the

proposed intervention components and the selected delivery format of the intervention are likely to be regarded as relevant and helpful by all HVs.

The proposed draft intervention comprises an incentivised (via CPD points) interactive face-to-face education and training session for all HVs; a training pack and resources for HVs (e.g., educational materials, paper-based practice tools, and educational materials and tools for parents); and awareness raising of the intervention (this could include posters and other promotional materials) amongst all staff who deliver the HCP 0-5 service in County Durham. The intervention will include a combination of didactic and interactive methods. The findings from the stage three and stage four workshops and recommendations from literature (411) have highlighted the importance of credibility of the individual(s) conducting the interactive training workshop. The number of HVs for each session of the training is provisionally suggested as 12 based on recommendations from HVs and relevant literature (412). A decision on the size of the training groups will be part of the process of refining this draft version of the intervention. The duration of the training workshop is suggested as approximately one working day (including breaks). Informal discussions with HV team leaders and published reports of delivery of training workshops for practitioners (394, 413) suggest that a one-day session is likely to be considered feasible and acceptable by stakeholders. An outline of the form of delivery that could be used for the intervention when it is ready for feasibility testing is suggested, developed by using an adapted version of the TIDieR framework (410). This is presented in Appendix T.

Objective 3.6 Specify the hypothesised causal mechanisms of change (desktop research)

Method

This objective involved specifying the processes (e.g., a psychological, social, or physical process) by which the individual BCTs included in this intervention are hypothesised to bring about behaviour change, i.e., their mechanisms of action (MoA) (390). In this context, MoAs are the theoretical constructs (e.g., knowledge, beliefs, attitudes) that represent the processes which influence behaviour, and the BCT-MoA link is the hypothesised causal pathway through which behaviour change occurs. Empirical evidence about the links between individual BCTs and their MoAs is limited. To identify the hypothesised links between the BCTs and their MoAs, I used the interactive online 'theory and technique' tool (402) (available at: <https://theoryandtechniquetool.humanbehaviourchange.org/tool>). The

tool provides a transparent, systematic, and accessible method of linking BCTs with their MoA. The tool is a heat map showing the links between 74 frequently used BCTs and 26 MoAs resulting in 1924 (74 X 26) cells. The strength of the postulated links between the BCT and their MoAs are determined by a study (402) which triangulated the data from two studies: the evidence synthesised from 227 published reports of behaviour change interventions (391), and an expert consensus study (392). The results of the evidence synthesised from the literature, expert consensus, and findings of triangulation of the data are shown within each BCT-MoA cell. The cells showing the stronger BCT-MoA links are coloured green; a 'green' cell implies that the BCT-MoA link has a p value of < 0.05 (lower p values indicate stronger links) in the literature study *and* was also rated as "definitely linked" by 80% of experts. For example, the cell for BCT 8.7 'Graded Tasks' and MoA 'Beliefs about capabilities' is shaded green; clicking on the cell shows that there is concordance between the literature and consensus studies: $p < 0.001$ in the literature study and 90% of experts in the consensus study agreed on the link.

Findings

Informed by the detailed guidance provided by the theory and techniques tool, I identified 34 BCT-MoA 'definite' links (shaded green) within the proposed intervention. The most frequently linked MoA in the intervention is "Beliefs about capabilities" which is targeted by five BCTs. Further, many of the included BCTs target multiple MoAs; for example, the BCTs "Information about health consequences" and "Social comparison" are each linked to four MoAs. The links between the BCTs included in this intervention and the behavioural processes they are hypothesised to be capable of changing are summarised in Table 4.26 (pages 164-165). Based on the hypothesised BCT-MoA links, a logic model of change was developed to graphically represent the BCTs included in the proposed intervention and the different hypothesised processes through which they influence behaviour (Figure 4.12).

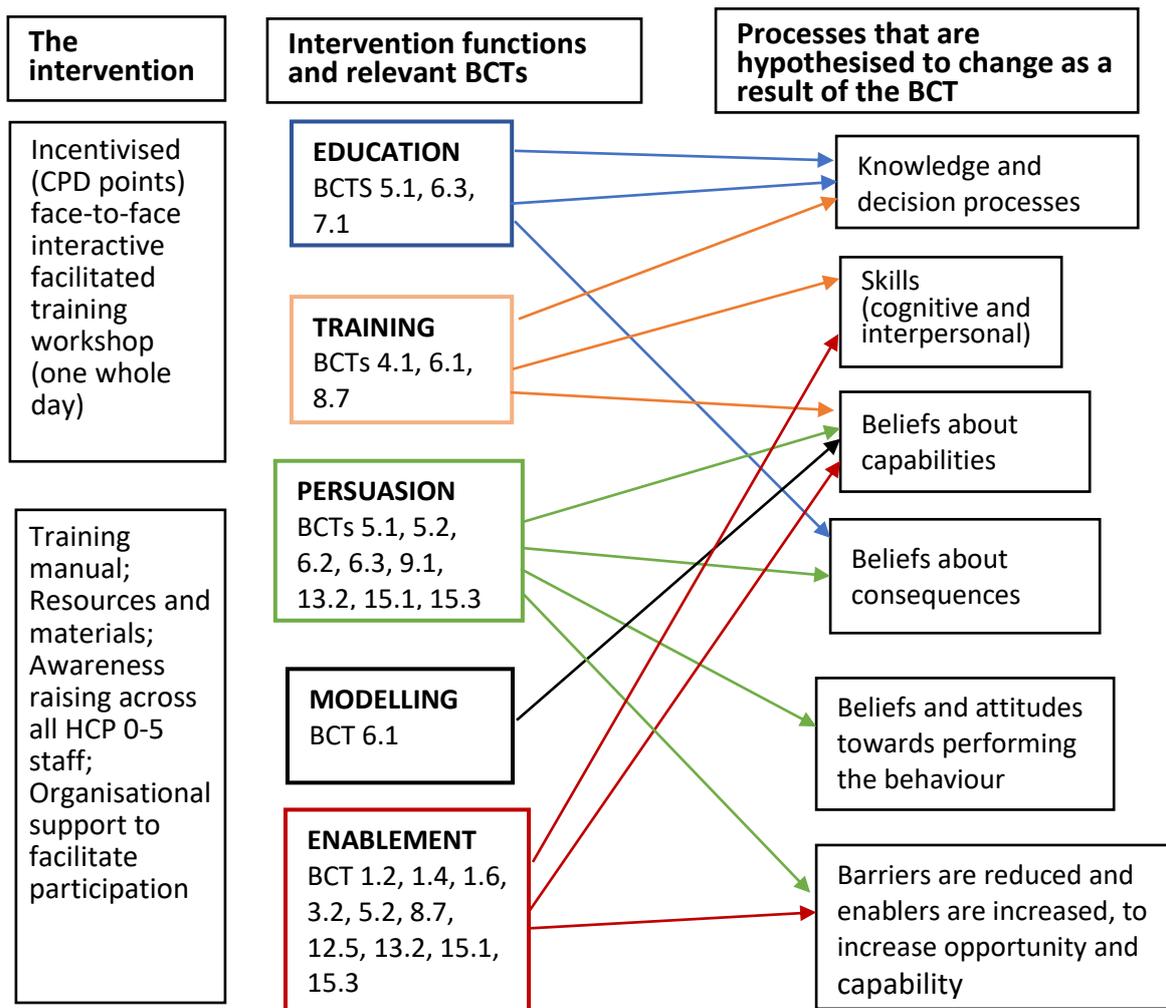


Figure 4.12. Logic model of the proposed draft intervention: specifying contents and hypothesised mechanisms of change; BCT labels are from BCT taxonomy v1.0.

Table 4.26. Hypothesised links between the behaviour change techniques (BCTs) included in the intervention and their mechanism of action (MoA) identified using the online Theory and Technique Tool (402); the BCT labels are from BCT taxonomy BCTTv1 (262); (Abbreviations: Psy C= psychological capability; Ref M= reflective motivation; O= opportunity; Phy = physical)

BCT label	BCTs used in the intervention	Knowledge (Psy C)	Beliefs about consequences (Ref M)	Attitudes towards the behaviour (Ref M)	Norms (attitudes held and behaviours exhibited of other people in a group) (Ref M)	Subjective norms (perceptions of what most other people in a group believe and do) (Ref M)	Increase resolve (intention) (Ref M)	Beliefs: ability to perform the behaviour (Ref M)	Skills (Psy C)	Social learning/imitation (Ref M)	Goals (mental representation of what HVs want to achieve) (Ref M)	Feedback processes (current behaviour is compared to a particular standard) (Ref M)	Triggering of the behaviour (Ref M)	Skills for managing or changing the behaviour (Psy C)	Environmental context and resources (Phy O)	Social influences (can cause oneself to change behaviours) (Social O)	Aid memory, attention, and decision making (Psy C)
1.2	Problem solving.																
1.4	Action planning.																
1.6	Discrepancy between current and expected behaviour																
3.2	Social support (practical)																
4.1	Instruction on how to perform the behaviour																
5.1	Information about health consequences																
5.2	Salience of consequences																
6.1	Demonstration of the behaviour																
6.2	Social comparison																
6.3	Information about other's approval																
7.1	Prompts/cues																
8.7	Graded tasks																

BCT label	BCTs used in the intervention	Knowledge (Psy C)	Beliefs about consequences (Ref M)	Attitudes towards the behaviour (Ref M)	Norms (attitudes held and behaviours exhibited of other people in a group) (Ref M)	Subjective norms (perceptions of what most other people in a group believe and do) (Ref M)	Increase resolve (intention) (Ref M)	Beliefs: ability to perform the behaviour (Ref M)	Skills (Psy C)	Social learning/imitation (Ref M)	Goals (mental representation of what HVs want to achieve) (Ref M)	Feedback processes (current behaviour is compared to a particular standard) (Ref M)	Triggering of the behaviour (Ref M)	Skills for managing or changing the behaviour (Psy C)	Environmental context and resources (Phy O)	Social influences (can cause oneself to change behaviours) (Social O)	Aid memory, attention, and decision making (Psy C)
9.1	Credible source																
12.5	Adding objects to the environment																
13.2	Framing/reframing																
15.1	Verbal persuasion of capability																
15.3	Focus on past success																

4.5.4 Phase 4: Identify feasibility outcomes and methods

Diverse factors related to the intervention context, recipients and intervention deliverers may influence the feasibility of delivering the proposed intervention to HVs (414). The MRC recommends conducting an exploratory study to rigorously assess the feasibility of the intervention prior to considering any research to evaluate its effectiveness (194). While the MRC framework suggests possible aims of exploratory studies, it does not provide an explicit definition of a feasibility study. To identify the methodological issues that should be addressed within a feasibility study of the newly developed intervention, I used the definition proposed by the National Institute of Health Research (NIHR): a piece of research conducted to establish whether a larger study can be conducted.

This phase had two objectives:

Objective 4.1: Identify feasibility outcomes and methods

Objective 4.2: Assess HV's rating of the importance and feasibility of the proposed outcomes and methods.

These objectives were completed in a sequential manner. In the following sections, the method(s) used for each objective and the findings from the work completed within each objective are described, using narrative text and tables.

Objective 4.1: Identify feasibility outcomes and methods of assessment (desk-based research)

Method

Currently, there is lack of consensus and clear guidance regarding the aims, designs and conduct of an exploratory study to assess the feasibility of a complex intervention (415). To identify important methodological issues, outcomes and methods for a feasibility study of this training intervention, I referred to updated MRC guidance on process evaluation of complex interventions (416) and published literature on methodological issues (417, 418) and research methods pertaining to feasibility research (419, 420).

Findings

I identified four methodological issues as important areas of focus for a feasibility study of the intervention: recruitment capability, feasibility of delivery (practicality), intervention fidelity, and acceptability. The feasibility outcomes related to those four issues, corresponding research questions, related feasibility outcomes and quantitative and

qualitative methods to assess those outcomes are summarised in Table 4.27. The use of qualitative methods in conjunction with quantitative methods is recommended in feasibility research literature (419). The methods proposed to assess the outcomes have previously been reported as acceptable and useful in feasibility studies of face-to-face behaviour change interventions (408, 421), to obtain answers to the questions related to the areas of focus identified for this study.

Table 4.27 Areas of focus and proposed feasibility outcome measures

Area of focus	Relevant feasibility research questions	Proposed outcomes and methods of assessment
Recruitment capability	<p>Can the planned number of Local Authorities/health visiting service provider sites be recruited?</p> <p>How many HVs are potentially accessible at the recruited provider site? How many HVs will agree/will be able to take part?</p> <p>Can attendance of the planned number of HVs for each session of the intervention be achieved?</p>	<p>Quantitative</p> <ul style="list-style-type: none"> • Number of provider organisations who register an interest to participate • Number of organisations declining the offer • Recruitment rate (HV): number of HVs who were in attendance (expressed as percent of total number of HVs who were invited) <p>Qualitative</p> <p>Reasons for declining/refusal at level of provider and individual HVs (free text response on invitation letter)</p>
Feasibility of delivery (practicality)	<p>How much time will be required to complete the recruitment procedures?</p> <p>How many sessions will be required to deliver the intervention to all HVs at the recruited site?</p> <p>How much time will be required to deliver the intervention at each site?</p> <p>Can the intervention be delivered as planned (current plan is to invite 12 HVs per session) with available resources, time, and materials?</p> <p>What are the possible logistical issues within the setting which will need to be accounted for/addressed for the delivery of the intervention?</p> <p>What are the implications with regard to time commitment of HVs and intervention facilitator(s) with regard to delivery of the training session?</p>	<p>Quantitative</p> <ul style="list-style-type: none"> • Time required (number of weeks) for recruitment procedures to be completed • Number of intervention sessions required to deliver the intervention to all recruited HVs at each site • The number of intervention sessions delivered at each site with the planned number of HVs (around 12 HVs) per session • Time required (in hours) for delivery of each session of the intervention <p>Qualitative: Researcher's notes</p>

Area of focus	Relevant feasibility research questions	Proposed outcomes and methods of assessment
Fidelity of delivery and fidelity of receipt	<p>Can the intervention be implemented consistently with fidelity?</p> <p>To what extent is the training intervention delivered as planned?</p> <p>To what extent is the intervention received by intervention recipients, as intended?</p>	<p>Qualitative:</p> <ul style="list-style-type: none"> •Video-recording of intervention session and facilitator's completed checklist •1:1 semi-structured interview with HVs (sub-sample) •1:1 semi-structured interview with intervention facilitator •Direct observation by trained researcher and researcher's notes
Acceptability (anticipated and experienced) of the intervention to HVs	<p>How acceptable is the intervention (as a whole) to HVs?</p> <p>What is the anticipated acceptability of the intervention to HVs?</p> <p>What is the experienced acceptability of the intervention to HVs?</p>	<p>Quantitative:</p> <ul style="list-style-type: none"> •Theoretical framework of acceptability questionnaire (7-item, 5 point Likert scale questionnaire); an open question will be included in the questionnaire (HV's will be invited to provide comments) <p>Qualitative:</p> <ul style="list-style-type: none"> •Feedback from recipients (group interview with sub-sample)

Objective 2. Participants' rating of the importance and feasibility of proposed methods (workshop activity).

Method

Proposed feasibility outcomes and methods related to assessment of recruitment, feasibility and fidelity of delivery, and acceptability were presented to participants of two stage four workshops. HVs from teams C and B took part in the workshops that were held on 9/10/2019 and 21/10/2019, respectively. HVs' views were obtained using a dot voting process similar to the process used in stage three workshops to collect HVs' ratings of BCTs.

Findings

Twenty-six HVs (20 HVs from teams C and six from team B, respectively) rated the importance and feasibility of eight outcome parameters and measures. I took the subjective decision to exclude the feasibility outcome (interview with facilitator, to assess fidelity of receipt) for the rating activity because this outcome relates only to the training facilitator. The findings are summarised in Table 4.28.

Table 4.28 Participants' rating of proposed outcome measures and methods

No	Feasibility outcomes and methods of assessment	% (rounded value) of HVs (n=26) who rated the method	
		Important	Feasible
1	Recruitment rate: number of HVs attending the intervention session expressed as a percentage of HVs who were invited to the session	77	81
2	Acceptability of the intervention content: questionnaire pre- and post-intervention (to be completed on the day of the session)	88	100
3	Acceptability of the intervention: group interviews with intervention recipients (sub-sample) on day of intervention	81	65
4	Feasibility of delivery: Number of sessions required to deliver the intervention to all HVs who have confirmed their intention to participate	85	85
5	Feasibility of delivery: Time (in hours) required for delivery of the intervention session at the site	65	77
6	Feasibility of delivery: Number of sessions delivered with the planned number of HVs (suggested: 12 per session) in attendance at the session	86	86
7	Fidelity of delivery: Audio-video recording of the intervention session by trained independent researcher	73	50
8	Fidelity of receipt: interviews with intervention recipients (sub-sample): HVs' self-reported comprehension of, and engagement with intervention activities	92	92
9	Fidelity of receipt: 1:1 interview with intervention facilitator (explore facilitator's subjective assessment of receipt of intervention based on their direct observation of recipients' verbal understanding and performance of skills)	Not presented to HVs for rating	

Post-workshop analysis

All eight parameters and methods were rated as important and feasible by the majority of the HVs. The proposed methods include measures for a comprehensive assessment of fidelity (i.e., fidelity of delivery and fidelity of receipt) of the intervention. Fidelity of *delivery* refers to the extent to which a behaviour change intervention is delivered as planned (422). The recipients of a behaviour change intervention are acknowledged as active participants (417). Intervention *receipt* (the recipient's side of fidelity) refers to recipients' understanding of the intervention and performance of the cognitive and behavioural skills in the intervention setting (417, 422, 423). The method "audio-video recording of the intervention" which is considered the 'gold standard' to evaluate the fidelity of delivery and receipt of intervention content (424) was rated as important and feasible by 73% and 50% of the participants, respectively. The relatively lower rating for feasibility of this measure suggests

that some HVs have concerns about video-recording of the training session. Studies that have used video recording of training programs for the purpose of fidelity assessment (421) have reported that practitioners may be concerned about loss of anonymity and may be reluctant to be video recorded, thus potentially altering their behaviours and the delivery of the intervention.

Undertaking a comprehensive assessment of fidelity of a complex intervention can help understand how and why deviations from the intervention protocol occurred and adaptations were needed (if there were any). Fidelity assessments can also help explore strategies to enhance (e.g., improvements to the training protocol and facilitator's checklist) and assess (e.g., independent researcher's direct observation techniques) fidelity assessments in a larger study (425). Comprehensive fidelity assessments have implications for cost and resources (e.g., researcher training in observation skills and note taking) (418, 426). Therefore, in addition to concerns about reactivity of recipients of the intervention, feasibility and practicality issues will need to be explored with stakeholders for the final selection of strategies and methods for fidelity assessment of a feasibility study of the intervention.

4.6 Discussion

This chapter describes the systematic development of a training intervention for HVs that is also conceptualised as a behaviour change intervention. The aim of the intervention is to change HVs' skills, confidence, intention, and eventually their practice behaviours. The intervention was developed by combining a co-development approach with the BCW framework. The process described here outlines how the theory-driven and evidence-based intervention was developed while involving HVs throughout and integrating their perspectives and preferences. The proposed draft intervention illustrates how relevant BCTs can be operationalised and assembled together into a coherent intervention that can be pragmatically delivered. Recommendations for the form of delivery of the face-to-face intervention and role specification of who delivers it have been made, based on the recommendations and suggestions of the workshop participants.

The detailed analysis of the barriers and facilitators to the target behaviours that was carried out using the COM-B model of behaviour enabled the identification of key behavioural

processes to target with an intervention. The proposed links between the COM-B and the TDF facilitated the identification of the specific theoretical domains of behaviour that represented the relevant change processes for this intervention. Targeting specific change processes is recommended, as this may increase the potential for effectiveness of the intervention (250). The systematic application of the APEASE criteria to contextualise the selection of intervention functions and content (BCTs) increases the potential for acceptability and feasibility of the intervention in the local context. However, this process was not straightforward. To address this, I reviewed the health visiting literature and other relevant literature on BCT-based implementation interventions designed for healthcare professionals. These sources were specified when presenting information about a certain criterion and informed my subjective decisions on intervention functions and BCTs.

In particular, the selection of the intervention functions raised challenges. As highlighted earlier in section 3.3 of this chapter and discussed in Table 4.17, “environmental restructuring” was identified as a relevant intervention function but was not included. This was after taking into consideration the scope of this research project, with its focus on “... developing a theory-based implementation to promote HVs’ implementation of practices recommended for prevention of excess weight gain in 0-2 year old children... **likely to be feasible and acceptable in the local (County Durham) context**” (pp 34-35 above). Various organisation-level barriers (e.g., lack of time and practice tools, no mandatory requirement to identify overweight in infants, no national-level care pathways for obesity prevention in infants) were identified by HVs at the workshops. The lack of resources (notably, PCP’s lack of time and practice tools) were also frequently reported as barriers in the SR. On the other hand, the availability of tools, and role support for the PCP (adequate time, adequate staff support) were identified as facilitators in the SR. Improving HVs’ implementation of guidelines and embedding them in routine health visiting practice will require addressing key organisational-level barriers (notably, staffing issues, provision of time-saving practice tools, clear care pathways) that were raised by workshop participants. Overcoming those barriers will likely require organisation-level changes (e.g., change in service provision). Policies (e.g., new guidelines, and care pathways) to support those changes will need to be implemented at the national rather than the local level (209, 210) and would therefore be outwith the independent remit of DCC.

The use of an established BCT taxonomy (BCT v1) (262) and guidance from the literature facilitated the identification of appropriate BCTs. However, selecting the most relevant or useful BCTs was difficult. Currently, there is limited evidence about what BCTs or groups of BCTs are likely to be most useful to target a particular theoretical determinant of behaviour. Also, there is very little understanding about how different BCTs compare in their effectiveness in inducing behaviour change. The selection of potentially useful BCTs was informed by recent methodological work by which BCTs have been mapped to relevant theoretical constructs of behaviour (402). Another challenge was operationalising the BCTs – namely, translating the BCTs into intervention components. Although the BCT taxonomy (262) provides definition of each BCT and examples of how they can be operationalised, there is no guidance or consensus in the literature on determining how best to operationalise and deliver selected BCTs within an intervention. The literature suggests that the approach and methods used to operationalise BCTs vary among intervention designers, depending upon the purpose of the intervention and the recipient group (233, 398). Currently, the evidence base to inform decisions regarding BCT operationalisation and delivery is limited; this has been attributed, in part, to poor reporting of complex interventions in published literature (427). In this study, the operationalisation of the selected BCTs was informed by available evidence from relevant literature on obesity training interventions for healthcare practitioners (202, 204, 397). The goal was to ensure that the different BCTs were assembled in a meaningful way so that they could be pragmatically delivered as a coherent intervention and address the needs of the target recipient group (HVs).

4.6.1 Application of the selected theoretical framework

The link between the COM-B and the BCW provided the basis for a systematic stepped approach to the development of the intervention that was grounded in theory. While guided by the BCW, the entire design process was collaborative and iterative, making it challenging to capture and describe. To maintain clarity, the process has been reported in a somewhat more linear manner than it actually happened. The sequential steps of the BCW framework were useful to guide the development process from an exploratory phase towards formulation of intervention strategies and content. The framework also helped to consider the full range of options and then to select those which are most likely to be appropriate and effective, through a systematic evaluation of the evidence and theory. Not all the steps

included in the BCW needed to be implemented as specified in the framework. For example, describing the problem of interest and selection of the behaviours of interest (guideline recommended practice behaviours for HVs for excess weight prevention in children aged 0-2 years) for this intervention were pre-specified (selected '*a priori*'). The BCW guidance also suggests identifying specific policy-related categories that are likely to be appropriate and effective in supporting the selected intervention functions. This research focused on behaviour change at the level of the individual, and therefore, changing policy was judged as outside the scope of this study. Hence, this step was not included. It was assumed that this intervention would fit under the category "service provision".

The multiple-behaviour approach adopted for developing the intervention increased the complexity of the influences that needed to be considered but also provided an opportunity to account for the realities of health visiting practice, which requires managing competing demands and priorities of the HV and the child/family. There are very few examples in the literature where the COM-B has been used to develop an intervention targeting multiple health professional behaviours simultaneously; typically, these interventions have used multiple theories that enable consideration of the multiple behaviour processes (428). Interventions designed through use of the COM-B usually focus on changing one or two key healthcare professional behaviours that are identified following a needs analysis using formative research with the target group (239, 429). Although the COM-B model was sufficient to identify what behavioural constructs needed to be targeted to facilitate behaviour change, it was helpful for me to refer to the more detailed theoretical constructs included in the TDF (218) and the dual process model for multiple behaviours (428), to inform the selection of appropriate BCTs and articulate the hypothesised mechanisms of actions of the BCTs. The guidance in the BCW literature facilitated this process.

4.6.2 Strengths and limitations

Strengths

The main strength of this study is that it adopted a systematic approach, using both evidence and theory, as recommended by the MRC framework for the development of complex interventions. The strategy for this intervention was determined after conducting a thorough assessment of the appropriate behaviour processes, understanding what it would take to achieve change in those processes, and how best to implement the strategy. The 'bottom-up

approach' taken to co-develop the intervention ensured that the intervention development was strongly informed by HV's knowledge and experiences.

An important consideration was that the behaviours of interest for this intervention are multiple inter-related behaviours. Therefore, it was relevant to adopt a multiple behaviour approach in developing the intervention. Using the comprehensive supra-theory COM-B model as opposed to a single theory of behaviour change (focusing on, for example, on the reflective processes of motivation) helped address the full range of possible influences on HV's performance of the behaviours. Accounting for both reflective (cognitive) and automatic (impulsivity, habits, emotional processing) motivational processes is strongly recommended for designing of interventions for healthcare professions that aim at multiple behaviour change (430). The inclusion of planning as a behaviour change strategy to address the post-intentional cognitive processes - action planning and coping planning – has been shown to be effective in adopting a new pattern of behaviour and avoiding previous or undesirable behaviours (431). As recommended in the literature on designing of interventions for multiple behaviour change (430), action planning and coping planning were operationalised into behaviour change techniques and included in this intervention.

The links between the behaviours and the theory-based BCTs employed to change those behaviours in this intervention have been clearly described. This will facilitate the testing of hypothesised causal pathways in any future trial of the intervention. An issue reported in the literature is problems of reporting of complex interventions, such as a lack of detailed description of the intervention and use of inconsistent terminology to specify the content of the intervention (195). The selection of BCTs from an established taxonomy of BCTs in this intervention allowed detailed description of intervention content using standardised terminology. The transparent and systematic process used in this research increases the potential for future replication and/or refinement of the developed intervention and facilitate discussion of the outputs of this research with other researchers and intervention developers.

Another important strength of this study is the detailed reporting of how potential recipients of the intervention were involved throughout the design process. Incorporating the perspectives and opinions of the intended users of the intervention in the development of implementation interventions is strongly recommended (369). The barriers and facilitators

identified as relevant in the local context by HVs were largely consistent with the factors identified in the systematic review. Thus, it can be said with confidence that the proposed intervention targets relevant barriers and facilitators. Further, the selection of intervention components and the designing of the format and delivery of the intervention were informed by HVs' views and preferences. This increases the chances that the intervention will be feasible to deliver and acceptable to HVs.

Limitations

Collaborative research approaches and the BCW framework are both resource-intensive methods. Involvement of HVs through the different stages of the design process had implications on the use of resources, particularly their time. Although representation from all five health visiting teams was considered relevant during the four practical stages of the co-design process (this would have required 20 workshops), issues such as feasibility and data saturation were important concerns. The decision to conduct 11 workshops (and not 20) meant that different stages of the co-design process involved engagement with HVs who cover specific areas within County Durham and therefore may hold different views and perspectives. Nonetheless, the analyses of the data from the different workshops suggested that data saturation was achieved using the strategy that was employed (a minimum of two and a maximum of three workshops in each stage) and conducting 20 workshops would not have added any additional value.

Demographic information on workshop participants (e.g., sex/ gender, age, ethnicity, years in practice) was not collected. Therefore, it was not possible to confirm whether the personal profile distribution of the HVs who took part in the workshops was representative of all County Durham HVs. Due to the lack of demographic information, it was also not possible to explore relationships (if any) between participants' characteristics (in particular their age, years in practice, socioeconomic profile of the area of their practice) and their perceptions of barriers and facilitators. There is some evidence – although very limited - that personal characteristics of healthcare professionals (such as gender/ sex, age, work experience, and personal weight status, socioeconomic profile of practice area) may influence their obesity prevention practice behaviours, and rating of barriers and facilitators (307, 321, 340, 341).

The designing of a tailored intervention using a collaborative approach can present

uncertainties, particularly when stakeholders' preferences do not align with findings from other sources of knowledge (247). In the proposed intervention, the BCT 'behavioural practice/rehearsal' (operationalised as Role Play) – for which there is evidence (391) that it can help with skills development (strong evidence) and induce positive beliefs about capability (less strong) – was excluded from the final list of the selected BCTs. The decision to exclude this BCT was based on the workshop data which showed that majority of participants did not accept Role Play. An important aspect of collaborative approach to intervention development is deciding how to manage and prioritise different sources of knowledge. However, it is not clear how best to integrate existing evidence from research with stakeholders' views, particularly when these views are not aligned with existing knowledge (243).

The decision-making processes throughout the different stages of the co-designing of the intervention – from behavioural analysis to intervention design – required me as the researcher to make subjective judgments and pragmatic decisions. It is possible that another researcher would have operationalised selected BCTs in a different way. The literature on intervention development studies often reports using multi-disciplinary consensus meetings and/or workshops conducted by experts to inform decision making throughout the phases of the development (257, 432). The judgments and decisions taken by me were informed by evidence- and theory-based guidance and lists of options provided in the BCW literature (218), current behavioural change intervention research (391, 392, 402), and the literature on development of behavioural theory and health psychology-informed training interventions. Importantly, the decision-making processes, and the outcomes of the different stages of the development were iteratively reviewed by my supervisors who have extensive experience in the field of development of complex interventions in healthcare.

4.6.3 Further research

This research has produced the first draft of a new intervention. An evaluation of the feasibility and acceptability of the intervention by carrying out research with intended recipients of the intervention (HVs) and intervention deliverer(s) is strongly recommended prior to considering research to assess the effectiveness of the intervention (194). Feasibility research is an essential component in the iterative and collaborative development of a complex healthcare intervention. Prior to formal feasibility testing, the current version of the

intervention will require further optimisation (refinement) (433). The optimisation process will require working with stakeholders and using their feedback to refine the content and form of delivery of the intervention, with the aim to design a prototype version that is ready for feasibility testing. A feasibility study of this intervention could offer HVs an opportunity to evaluate the content and delivery of the intervention and suggest improvements, to better suit their needs and preferences. The findings of a feasibility study could be used to (1) improve the content and delivery of the intervention; and (2) inform decisions about whether it would be appropriate to proceed to the next step. This could be a pilot trial (a miniature version of a definitive trial) to test aspects of study design and procedures for data collection and evaluation and inform a larger main trial in the future. In the next chapter (Chapter 5), I have set out a protocol for a feasibility study of the intervention.

4.6.4 Conclusion.

This chapter has described a comprehensive process to develop a face-to-face interactive BCT-based education and training intervention for HVs to strengthen their role in prevention of overweight in children under two in primary care. The intervention is conceptualised as a behaviour change intervention. It aims to improve HVs' knowledge, skills, confidence, and beliefs to facilitate increased adherence to practices recommended by evidence-based guidelines, to promote healthy and prevent excess weight gain in children aged 0 to 2 years. The intervention was developed by systematic application of theory, collaboration with the target recipients of the intervention, and review of the evidence base. This increases the likelihood that the intervention will be feasible to deliver in the local context and acceptable to HVs. Revisions and adaptations and further refinements will likely be required, informed by input from relevant stakeholders, including the deliverers of the intervention. Subsequently, the newly developed intervention should be tested for feasibility and acceptability by conducting research with HVs (the intended recipients of the intervention). The systematic and transparent approach used in the designing of this intervention will facilitate a thorough evaluation via a feasibility study.

Chapter 5. Feasibility study protocol

This chapter sets out a protocol for a feasibility study of the intervention developed in this research. Prior to the development of this protocol, feasibility outcomes (parameters) and methods for measuring the outcomes were identified, as part of co-development of the intervention. This work is described in detail in Chapter four (subsection 4.5.4) of this thesis.

5.0 Background

A face-to-face training intervention has been designed for health visitors (HVs) with the aim of strengthening their role in prevention of excess weight gain in children aged 0-2 years. Interactive training interventions have the potential to facilitate increased adherence to guideline recommended practices and improve patient outcomes (397). The intervention was systematically developed using tools and methods provided by the Behaviour Change Wheel (BCW) framework (218), and is based on behaviour change theory, systematic review evidence, and consultation work with HVs (the target recipient group of the intervention). Involving HVs in the designing of the intervention increases the potential for it to be regarded as acceptable and engaging by HVs, and feasible to deliver in real-world settings (369). The behaviour change techniques (BCTs) incorporated within the intervention were selected from an existing BCT taxonomy (262) and a research database of BCTs (402).

Currently, there is limited understanding of how feasible it is to translate BCTs into usable and practicable components for face-to-face training interventions for health professionals (434). The MRC framework for development of complex interventions recommends conducting exploratory studies to generate the evidence needed to resolve any problems with the intervention itself, and to determine whether and how to proceed to an evaluation study (416). While the MRC guidance suggests possible aims of exploratory studies, it does not provide an explicit definition of a feasibility study. There are diverse views within the UK research community about the definition and purpose of such studies (416). This protocol was developed using the definition proposed by the National Institute of Health Research (NIHR) (435) of a feasibility study: research done before a main study to determine if the intervention can be delivered, and whether the proposed feasibility evaluation methods can be enacted.

The guidance from the NIHR specifies what a feasibility study should and should not involve (436). However, it provides little methodological guidance about how to design a feasibility study. The existing guidance in the literature on designing of feasibility studies are mainly for pilot trials (a particular sub-set of feasibility studies) that focus primarily on the feasibility and acceptability of trial procedures, such as recruitment, retention, randomisation, and data collection. This presents challenges for researchers who are planning a feasibility study of a newly developed intervention, with a view to evaluate the process of implementation. The updated MRC framework for process evaluation of complex interventions (194) was used as an overarching guide for developing this protocol. The identification of relevant feasibility outcomes was guided by referring to the literature on feasibility research (419, 420) and methodological issues that are acknowledged as important for assessing feasibility of behaviour change interventions (417, 418, 437).

5.1 The intervention

The BCT-based training intervention is conceptualised as a healthcare professional behaviour change intervention. The intervention comprises a one-off one-day interactive training session for groups of HVs (currently proposed as 12 HVs per session), a training workbook, and written resources for HVs to use for themselves and to share with parents. The training session consists of a mix of didactic and interactive activities (e.g., lectures, demonstration of good practice, case studies, individual and group reflection, and developing and practising skills). Training materials for HVs will provide an outline of the nature of the intervention and its rationale, and an introduction to national guideline recommended practices for promotion of healthy but not excessive weight in children aged 0-2 years. A summary of these guidelines has been presented in Table 1.1 (Chapter one). HVs will be offered accredited continuing professional development (CPD) points as an incentive for participation. Opportunities for CPD are useful for HVs because they enable them to fulfil their obligation to adhere to the expected professional standards set by their regulatory body (UK Nursing and Midwifery Council) which includes meeting CPD requirements (438), and potentially contribute to HVs' efforts to improve their career prospects (439). The intervention will be delivered by facilitator(s) who will have expertise in infant/child healthy weight and in education and training of HVs. An intervention manual will be developed for use by the facilitator(s) for the purpose of standardising the content and delivery of each intervention session. The manual will outline the components of the intervention, as well as

the structure, sequence, and timing of delivery of the various elements to be used by the facilitator(s).

5.2 Aims and objectives

The proposed study aims to evaluate the feasibility, acceptability, and fidelity of delivering a face-to-face training intervention to HVs. The overarching research question is: can this intervention be delivered, as planned? Specific objectives are to:

1. Evaluate the capability of recruitment at the level of the local authority/service provider and at HV level
2. Evaluate the feasibility (practicality) of delivering the intervention at participating sites
3. Evaluate the fidelity of delivery and fidelity of receipt of the intervention
4. Evaluate the acceptability (anticipated and experienced) of the intervention

The feasibility outcomes and methods related to those four issues, corresponding research questions, related feasibility outcomes and quantitative and qualitative methods to assess those outcomes are summarised in Table 5.1.

Table 5.1 Proposed outcomes and assessment methods for a feasibility study.

Area of focus	Relevant feasibility research questions	Proposed outcomes and methods of assessment
Recruitment capability	<p>Can the planned number of Local Authorities/health visiting service provider sites be recruited?</p> <p>How many HVs are potentially accessible at the recruited provider site? How many HVs will agree/will be able to take part?</p> <p>Can attendance of the planned number of HVs for each session of the intervention be achieved?</p>	<p>Quantitative</p> <ul style="list-style-type: none"> •Number of provider organisations who register an interest to participate •Number of organisations declining the offer •Recruitment rate (HV): number of HVs who were in attendance (expressed as percent of total number of HVs who were invited) <p>Qualitative</p> <p>Reasons for declining/refusal at level of provider and individual HVs: free text response on invitation letter</p>
Feasibility of delivery	<p>How much time will be required to complete the recruitment procedures?</p> <p>How many sessions will be required to deliver the intervention to all HVs at the recruited site?</p> <p>How much time will be required to deliver the intervention at each site?</p>	<p>Quantitative</p> <ul style="list-style-type: none"> •Time required (number of weeks) for recruitment procedures to be completed •Number of intervention sessions required to deliver the intervention to all recruited HVs at each site

Area of focus	Relevant feasibility research questions	Proposed outcomes and methods of assessment
Feasibility of delivery	<p>Can the intervention be delivered as planned (current plan is to invite 12 HVs per session) with available resources, time, and materials?</p> <p>What are the possible logistical issues within the setting which will need to be accounted for/addressed for the delivery of the intervention?</p> <p>What are the implications with regard to time commitment of HVs and intervention facilitator(s) with regard to delivery of the training session?</p>	<ul style="list-style-type: none"> •The number of intervention sessions delivered at each site with the planned number of HVs per session •Time required (in hours) for delivery of each session of the intervention • Number of participants per session <p>Qualitative: Researcher's notes</p>
Fidelity of delivery and fidelity of receipt	<p>Can the intervention be implemented consistently with fidelity?</p> <p>To what extent is the training intervention delivered as planned and intended?</p> <p>To what extent is the intervention received by HVs?</p>	<p>Qualitative:</p> <ul style="list-style-type: none"> •Video-recording of intervention session •Fidelity checklists completed by facilitator, researcher, and recipients •1:1 semi-structured interview with HVs (sub-sample) •1:1 semi-structured interview with intervention facilitator •Researcher's notes
Acceptability (anticipated and experienced) of the intervention	<p>How acceptable is the intervention (as a whole) to HVs?</p> <p>What is the anticipated acceptability of the intervention to HVs?</p> <p>What is the experienced acceptability of the intervention to HVs?</p>	<p>Quantitative:</p> <ul style="list-style-type: none"> •Theoretical framework of acceptability questionnaire (7-item, 5 point Likert scale questionnaire); an open question will be included in the questionnaire (HV's will be invited to provide comments) <p>Qualitative:</p> <p>Feedback from recipients (group interview with sub-sample)</p>

5.3 Method

5.3.1 Design overview

The study will be conducted in two phases; phase one (refining the newly developed intervention to prepare it for feasibility testing) and phase two (delivery and feasibility testing). While the phases are described separately in the protocol, the overall process is understood to be iterative, due to likely overlap between the refinement procedure and feasibility testing. For example, experience at the time of first delivery of the intervention is likely to lead to (minor) modifications of the organisation of the training session, e.g., in respect of timing of the various activities. The components and mode of delivery of the

newly designed intervention (described in detail in the preceding chapter) were optimised by applying the APEASE (acceptability, practicability, effectiveness, affordability, side-effects, equity) criteria (218) and further refined by HVs' assessment of their relevance, acceptability and feasibility. Consideration of the APEASE criteria, a component of the BCW framework, is recommended to guide the selection of intervention components that are more likely to be appropriate for the intervention.

During phase one, we will present the current version (first draft) of the intervention to representatives from the proposed target audience (e.g., experienced HVs who work on the Healthy Weight workstream) and other stakeholders to incorporate their views and expertise in further optimising the intervention and in planning a strategy to deliver it. Obtaining feedback on early versions of the intervention is more likely to create a prototype that is likely to be accepted by the recipients of the intervention and feasible to deliver in real-world settings (433). The optimisation work will potentially involve a series of iterations whereby each iteration will include an assessment of how acceptable, engaging, and feasible the intervention is likely to be. A participatory approach will also be used in developing, designing, and producing intervention materials. We will pilot test relevant materials with HVs (for the materials focused for their use) and with parents (for materials to be provided for them), with the aim to improve the quality of the materials and to ensure that the materials are fully understood by the target population(440). We will collaborate with stakeholders and design specialists to design a training pack for HVs (including all of the intervention materials) and resources to support their practice (e.g., summary of guidelines, paper-based decision making and communication tools). We will develop a pack containing a manual and script for the intervention facilitator's use during the delivery of the intervention, with the aim of standardising the content and delivery of each session to different groups of HVs. This phase will conclude with consensus on the final prototype of the intervention for feasibility testing and a strategy for delivery of the intervention.

In phase two, the prototype intervention developed in phase one will undergo feasibility testing to assess the feasibility of recruitment, feasibility of implementation (including adherence to protocol by facilitator and recipients), and acceptability of the intervention as a whole. This will involve delivering the intervention to HVs at two provider sites, with groups of approximately 12 HVs per session. The expectation is that the information

gathered from the study will help to further refine the content and form of delivery of the intervention, and inform decisions on the plausibility and value of progressing to a miniature version of a future evaluative study (i.e., a pilot trial) and subsequently to a full evaluation.

5.3.2 Data collection

As recommended by feasibility research literature (194, 419), we will use qualitative methods (e.g., semi-structured interviews) in conjunction with quantitative methods (e.g., questionnaires, data on attendance rates) to address the objectives of this study. Feedback questionnaires will include an open-ended question to capture data that might offer insights or issues not captured in the closed questions. Data will be gathered from intervention recipients and the intervention facilitator(s). All interviews (1:1 and group interviews) will be audio-recorded. The researcher gathering the data will keep a research journal to record information about activities and the methods used. The researcher's notes will include documenting what is learned about the setting, the recipients of the intervention, and intervention delivery. These notes will be used for reflection and to refine the focus for qualitative work by considering exploratory questions such as: what is relevant? what is it that we needed to find out more about? An outline of the data collection plan is presented in Table 5.2 (following page).

5.3.3 Data analysis

Thematic analyses of the verbatim transcripts of recordings of the interviews (1:1 and group interviews) will be conducted to generate representative themes and subthemes (441). The researcher's observation notes and HVs' responses to open-ended questions on the questionnaires will be inductively coded (i.e., not using a pre-existing coding frame), using qualitative content analysis method (442). The quantitative data will be presented in descriptive tables presenting percentages, frequencies and measures of central tendency and variability.

Table 5.2 Data collection plan for a feasibility study of the intervention

Feasibility outcome	Data sources
Recruitment capability	<p>Quantitative</p> <ul style="list-style-type: none"> • Number of provider organisations who register an interest to participate • Number of organisations declining the offer • Recruitment rate of HVs for each site: number of HVs who attended the sessions (expressed as percent of total number of HVs who were invited) <p>Qualitative</p> <ul style="list-style-type: none"> • Reasons for declining/refusal at level of provider and individual HVs (if provided)
Feasibility of delivery	<p>Quantitative</p> <ul style="list-style-type: none"> • Time (per site and in total) in weeks, required for recruitment procedures to be completed • Number of intervention sessions required to deliver the intervention to all recruited HVs at each site • Time required (in hours) for delivery of each session of the intervention • Number of sessions delivered with the planned number of HVs (currently proposed as twelve per session) at each site • Number of participants per session (range and measure of central tendency) <p>Qualitative</p> <ul style="list-style-type: none"> • Researcher's notes
Fidelity of delivery and fidelity of receipt	<p>Qualitative:</p> <ul style="list-style-type: none"> • Video-recording of intervention session • Fidelity checklist completed by facilitator • Fidelity checklist completed by recipients • 1:1 semi-structured interview with HVs (sub-sample) • 1:1 semi-structured interview with intervention facilitator(s) • Researcher's notes and completed fidelity checklist
Acceptability of the intervention	<p>Quantitative:</p> <ul style="list-style-type: none"> • Theoretical framework of acceptability questionnaire (7-item, 5-point Likert scale questionnaire); an open question will be included in the questionnaire (HV's will be invited to provide comments on overall acceptability of the intervention and suggestions for improvement) <p>Qualitative:</p> <ul style="list-style-type: none"> • Feedback from recipients (group interview with sub-sample of HVs)

5.3.4 Recruitment capability

Recruitment at the level of local authorities/health visiting service providers and then at individual Health Visitor level, as would be required for this study and any future evaluative study, is likely to be a complex process (443). Additionally, a study involving multiple sites may experience different recruitment challenges across the participating sites (444). An

evaluation of recruitment capability will help identify potential challenges with recruitment and areas where improvements will need to be made to facilitate recruitment.

Recruitment of service providers

The target intervention recipients are HVs who lead the delivery of the Healthy Child Programme (HCP) 0-5. Health visiting services in England are commissioned and funded by local authorities (LAs)(126). We plan to recruit two LA/service providers so that we can deliver the intervention at two sites to test the feasibility of the intervention. One site will be Durham County Council (DCC), the area in which the intervention was developed. However, delivering the intervention in that setting may give an over-optimistic impression of feasibility and acceptability, due to existing levels of engagement and enthusiasm. Therefore, a second site, naïve to the intervention, will also be included in the feasibility study. Excluding DCC, all the 11 Children's services listed in the directory of the Association of Directors of Children's Services in Northeast England will be provided with study details and 'expression of interest' forms. We have focused on service providers in Northeast England after having considered the socioeconomic and cultural setting in which the intervention was developed. In the Northeast, an overwhelming majority (around 95.5%) of the population are identified as British White/other White (445). In addition to the socioeconomic environment, race/ethnicity, culture, and societal factors have implications for childhood obesity prevention efforts (5). The intervention will need to be adapted (to be made more culturally competent) before considering rolling it out for HVs who work in more ethnically diverse areas (446).

In areas where the LA has commissioned health visiting services from external service providers (i.e., NHS community health services), study details and 'expression of interest' forms will be sent to both commissioning leads and service providers. The information will specify that not all commissioners/providers who register an interest in participating will be offered the invitation to take part in the feasibility study. By mailing expression of interest forms to all eligible commissioning leads/providers, we will gain an understanding of the potential number of LA/service providers that would be interested in participating, and the feasibility of recruiting a sufficient number of sites in a future trial. If a particular LA is interested but the commissioned NHS provider is not (or vice versa), we will approach other LA and provider organisers who have registered an interest in participating.

Recruitment of health visitors

We aim to recruit all HVs who are registered within each of the recruited service provider sites and deliver the HCP 0-5 service in areas covered by the service provider. Once the two selected service providers are recruited to the study, the research team will meet with health visiting service managerial staff at each site separately, to agree on how, where and when the intervention will be delivered. At these meetings, the managers will be provided with an overview of the feasibility study and the intervention, and all relevant study documents (e.g., participant information sheet, consent forms) for distribution to their teams of HVs.

Evaluation of recruitment capability

We will document the number of 'expression of interest' forms sent to LA/service providers, the number of LA/service providers who express interest in taking part, and the number who declined (including reasons for declining if provided). We will document the number of HVs who receive the invitation and agree to take part, and the number who are not available to take part (including reasons for declining or non-availability). The recruitment rate for HVs will be the number of HVs who attend the training intervention expressed as a percent of the total number of HVs who are invited.

5.3.5 Evaluation of feasibility of delivering the intervention

Organisational context (such as organisational environment and culture) is a key factor in the successful implementation of complex interventions in healthcare (447). It is important to explore practical issues that are likely to have implications for resources (e.g., facilities, time for intervention deliverers and recipients, and commitment) required for delivery of the intervention sessions. We will gather data on: (1) total time required for recruitment procedures to be completed (calculated as number of days from the first contact with a site to provide them with information about the study, and the completion of recruitment of HVs at that site); (2) the number of intervention sessions required to deliver the training session to all recruited HVs at each site; (3) the number of training sessions delivered at each provider site with the planned number of HVs in attendance; and (4) time required for intervention delivery (calculated as the number of hours required for the delivery of the

intervention, including the time required for any preparatory work by the facilitator and time spent in the training workshops themselves).

5.3.6 Evaluation of fidelity of the intervention

The importance of implementation fidelity in achieving the intervention effects is well recognised (194). Fidelity of delivery refers to the extent to which a behaviour change intervention is delivered as planned (422). The recipients of a behaviour change intervention are acknowledged as active participants. Intervention receipt refers to recipients' understanding of the intervention and performance of the cognitive and behavioural skills in the intervention setting (417, 422, 423). Receipt is important because it is a pre-requisite to demonstrate enactment, i.e., recipients using the skills demonstrated at the intervention in their real-world settings. Achieving fidelity of delivery and receipt of a behaviour change intervention is challenging; fidelity is particularly difficult to achieve when interventions are scaled up for wider roll-out (448). To understand the challenges and identify areas of potential improvement, it is recommended to measure fidelity using methods that are considered as psychometrically robust, reliable and of high quality (417, 418, 426). However, the acceptability (e.g., willingness of intervention users towards measurements and procedures) and practicality (e.g., potential for increasing the burden for intervention users) of fidelity assessment methods, and additionally, the implications for resources (notably, time and cost) for conducting fidelity assessments must also be considered (418, 426).

Including a strategy to assess fidelity in this study could help to understand what measures and procedures may be feasible to implement in a future evaluation study, identify facilitator's training needs, and to inform strategies to potentially enhance fidelity of delivery (e.g., making improvements to the manual and script for intervention facilitator's use) and fidelity of receipt (e.g., making improvements to the contents of the training materials) (449). Methods to assess fidelity vary from study to study, according to the nature of the intervention, and the intervention context (417). We referred to recommendations in published literature on fidelity assessments of behaviour change interventions (417, 418), and considered the context of this intervention and the study objectives, to develop the plan methods for evaluation of intervention fidelity.

We will assess the fidelity of delivery using methods that have previously been reported as feasible, acceptable and useful in similar contexts (408, 421). This training intervention is made up of a number of sections, with each section involving the delivery of a number of BCTs. The facilitators will have the intervention manual to use for the delivery of the training session; this is expected to enhance the consistency and fidelity of delivery of the intervention (450). A member of the research team will observe the session and take notes. The facilitator and the researcher (acting as the independent observer) will complete a fidelity checklist (including all the components of the intervention) using coding guidelines that will be developed for their use, specifically for this study (451). To enable an objective method of assessment, the training session will be video-recorded. Fidelity of delivery will be analysed from the completed checklists (by the facilitator and the researcher), the content analysis of the researcher's notes, and the analyses of the video recordings. The video recordings will be reviewed and independently coded by two trained researchers, using a coding manual that will be developed specifically for this study, to record whether or not the distinct components of the intervention and the associated BCTs were present in the recording. Any disagreements between the two coders will be resolved through discussion with a third researcher by reviewing video footage of the segments of the session for which coding discrepancies were observed. The coding analyses will provide an assessment of what was actually delivered. The intervention components and BCTs reported as being delivered by the facilitator and those coded as delivered by the researcher, and the analysis of the recording will then be compared with the planned intervention components and BCTs (as specified in the intervention manual).

To assess the fidelity of receipt, we will use methods that have been reported in previous research as feasible, acceptable, and useful (417, 418). Recipients will be asked to complete a fidelity checklist using coding guidelines developed for their use, specifically for this study (451). At the completion of the training session, we will invite a sub-sample of HVs (a convenience sampling strategy will be used) to a 1:1 semi-structured interview. At this interview, we aim to explore intervention recipients' understanding of the topics that were covered and their views about how they felt performing the skills that were discussed/demonstrated at the training session. We will invite the facilitator(s) to a 1:1 semi-structured interview after the completion of the training session. At the interview, we aim to explore facilitators' subjective assessment of receipt of the intervention based on their direct

observation of recipients' verbal understanding and performance of skills during the intervention. Fidelity of receipt will be analysed from recipients' completed checklists, thematic analyses of the transcribed audio recordings of the interviews with HVs and with the facilitator, and content analysis of the researcher's observation notes.

5.3.7 Evaluation of acceptability of the intervention to recipients

Intervention acceptability, defined as whether the intervention is appropriate for those who will use it (452), is recognised as an important requirement for the successful delivery of an intervention (420). An intervention recipient's rating of acceptability prior to taking part in the intervention may change after taking part. Recipients' rating of acceptability is closely linked to how they engage with the intervention (intervention receipt) (418, 426). Hence, evaluation of acceptability of the intervention to recipients is an important feasibility outcome for a behaviour change intervention.

We will assess acceptability qualitatively and quantitatively. We will use an "Acceptability questionnaire" (included in Appendix U) based on the Theoretical Framework of Acceptability (TFA) questionnaire (452) to assess both anticipated (prior to taking part in the training, T1) and experienced acceptability (after taking part in the intervention, T2) of the intervention to HVs. The TFA questionnaire has been reported in previous research as a useful tool to investigate and analyse participants' acceptability of behaviour change interventions (437). The TFA consists of seven constructs; these are recipients' attitudes (feelings about taking part in the intervention), estimate of burden (effort required to participate), perceived effectiveness (potential for the intervention to achieve its purpose), ethicality (aligns with recipients' professional values), understanding of the intervention (how the intervention is supposed to work), opportunity costs (what must be given up to engage in the intervention), and self-efficacy (confidence that the behaviours required to participate in the intervention can be performed). Thus, the data generated from the questionnaire is expected to provide an in-depth understanding of acceptability. HVs will be asked to provide their responses on all seven items on the questionnaire using a 5-point Likert scale, ranging from 'strongly disagree' (1) to 'strongly agree' (5).

At the end of each session of the intervention, we will invite a sub-sample of recipients to a group interview (a convenience sampling strategy will be used) to gather their views of the intervention as a whole. Acceptability will be evaluated by quantitative analysis of HVs'

responses on the TFA questionnaire and thematic analysis of the transcribed audio recordings of the group interviews. Pearson's correlation coefficient (453) will be used to examine the associations between anticipated and experienced acceptability data from the TFA questionnaire.

5.4 Feedback from recipients

Feedback from recipients of the intervention play an important role in the assurance and enhancement of the quality of the delivery of education and training. We will ask HVs to complete a pre-designed evaluation questionnaire (included in Appendix V) which will collect information about their experiences at the conclusion of the training. The items in the questionnaire reflect the principles for CPD in health and social care published by the Interprofessional CPD and Lifelong Learning UK Working Group (454). An open-ended question will be included within the questionnaire to capture information that might potentially offer insights or issues not captured in the closed questions.

5.5 Discussion

The study protocol addresses questions about whether and how the intervention can be delivered in real-world settings. A feasibility study (after the intervention has been optimised, with input from stakeholders) will offer HVs an opportunity to evaluate the content and delivery of the intervention and provide their views about how it can be improved, to better suit their needs and preferences. By focussing on the *process* of implementing the intervention, the proposed study could provide useful data to explore issues such as recruitment capability to address inherent uncertainties (such as intervention content and mode of delivery); acceptability of the intervention to recipients and key stakeholders; and capacity of intervention facilitator(s) to deliver the intervention within the infrastructure, routines, resources, and time constraints of the research site.

Chapter 6. General discussion and conclusion

6.1 Recapitulation of thesis aim and objectives

This thesis was prompted by a decision of the Director of Public Health, Durham County Council (DCC) to develop, in partnership with Newcastle University, a PhD research study to support professional practice development of health visitors (HVs) who deliver the Healthy Child Programme 0-5 in County Durham (211, 212). Strengthening HVs' role in prevention of excess weight gain in children aged 0-2 years was identified as a relevant area of research by the Public Health department of DCC, based on feedback from practitioners who work with families in County Durham.

The development of the intervention involved two separate studies that were carried out sequentially: (i) a mixed methods systematic review (SR) to synthesise the available evidence on primary care practitioners' (PCPs) current practices for prevention of obesity in children aged 0-5 years and factors that influence, positively or negatively, implementation of guideline recommended practices, as perceived by PCPs (Study One, described in Chapter Three); and (ii) using a collaborative approach, and both quantitative and qualitative methods of data collection and synthesis, development of an intervention to promote HVs' implementation of practices recommended for prevention of excess weight gain in 0-2-year-olds that is likely to be acceptable to HVs and feasible to deliver in the local context (Study Two, described in Chapter Four). A protocol for a feasibility study of the newly developed intervention is incorporated in the intervention development research (described in Chapter Five). Each component study had its own aims and objectives which were discussed with the findings at the end of the relevant chapter, along with the methodological strengths and limitations of the component study. The principal findings of the thesis, in relation to the research objectives stated above, methodological strengths and limitations of the approach taken, strengths and limitations of this research project as a whole, and recommendations for future research are discussed below.

6.2 Summary of main findings

6.2.1 Systematic Review (Study one)

The findings of the SR were key to (1) understanding of PCPs' behaviours in the context of their professional role in prevention of excess weight gain in children aged 0-5 years;

and (2) providing a strong rationale for the development of a behaviour change intervention, to increase PCPs' adherence to evidence-based practices. The review provided strong evidence that PCPs do not consistently adhere to practices recommended for prevention of excess weight in children aged 0-5 years. Addressing this gap is important because providing parents of 0-5 year olds with evidence-based advice and recommendations can improve parental knowledge and practice, and prevent excess weight gain in children (455, 456). Additionally, targeting early life risk factors within their socioeconomic context through appropriate interventions may help reduce inequalities in childhood obesity (117, 457). The SR findings clearly suggested that increasing implementation by PCPs of guideline recommended practices is an important strategy for childhood obesity prevention.

The theoretical analysis of the barriers and facilitators identified within the SR provided an understanding of how those factors influenced PCPs' capability, opportunity, and motivation for engaging, or not engaging, with the recommended clinical behaviours. Defining the problem (decreased adherence to recommended practices) in behavioural terms helped to identify the changes that were needed, at the level of the individual practitioner for the target behaviours to be achieved. The analysis suggested that addressing PCP-level barriers will likely require a range of education and training activities focussed on building PCPs' knowledge and skills, and also on shifting their views about the importance and impact of early prevention interventions and their beliefs about their capabilities. The review also provided evidence about the importance of a supportive practice environment to sustain PCPs' motivation to embed recommended practices in their existing routines. The findings of the SR supported the findings of previous research which show that achieving effective engagement of PCPs with childhood obesity prevention requires addressing not only PCP-level barriers but also organisational-level and family-level barriers (209, 210).

6.2.2 Intervention development (Study two)

A training intervention has been developed, with the aim of strengthening HVs' role in prevention of excess weight in 0-2 year old children. The target behaviours for the intervention were identified by synthesising the relevant guidelines for HVs in England (5, 57, 140, 160, 162). As recommended by the Medical Research Council (MRC) framework for development of complex interventions (219), the intervention is based on theory, and informed by evidence from research and consultation work with potential users of the

intervention. It is appropriate to emphasize here that the MRC framework used as an overarching guide for this research was published in 2008. This guidance has been recently replaced by a new framework, commissioned jointly by the MRC and NIHR (458). Published on 30 September 2021 (after the date of original thesis submission), the updated guidance has incorporated important conceptual, methodological, and theoretical developments that have taken place since 2006. The new framework provides guidance for researchers to work closely with stakeholders throughout the research process, and to design and conduct research that is informed by diversity of perspectives and appropriate selection of methods.

The findings of the SR (Study One) were instrumental in informing the exploratory and consultative work that was carried with HVs using series of interactive participatory workshops. The Behaviour Change Wheel (BCW) (218) was used as a tool to guide the systematic development of the theory-based intervention. Theoretical analysis of key determinants (barriers and facilitators) of HVs' practices identified gaps in HVs' capability, opportunity, and motivation. Relevant intervention strategies and theory-linked behaviour change techniques (BCTs) which could potentially address HVs' knowledge, skills, attitudes, and beliefs were identified, informed by evidence from research and guidance from the BCW literature. The content and design of the intervention were optimised by applying the APEASE (acceptability, practicability, effectiveness, affordability, side-effects, equity) criteria (218) and refined by HVs' assessment of the acceptability and feasibility of the proposed BCTs. Operationalised versions of the BCTs selected for the intervention were acceptable to HVs. The form of delivery of the intervention was refined by eliciting the views and perspectives of HVs, to maximise the possibility that the intervention will be sensitive to their needs and the complexities of their practice setting.

The proposed intervention comprises a mix of didactic and interactive activities, with a focus on opportunities for developing and practicing skills, reflection on practice, and behaviour change. Theory-based training interventions that include interactive and skills development components have greater potential to produce improved outcomes for practitioners (increased knowledge, confidence, communication skills, and improved practice implementation) than training that uses primarily a didactic approach (205, 397).

6.2.3 Feasibility study protocol

The feasibility study protocol development work (presented in chapter five) is contextualised as a component of the overall phased approach to the intervention development. The importance of conducting exploratory studies (e.g., a feasibility study) of complex interventions prior to considering research to evaluate their effectiveness is well established (194). Specifying what the study should achieve (aims and objectives) and what it should entail (feasibility outcomes) was a challenge because currently there is lack of consensus regarding the purpose and methodological issues that should be addressed by a feasibility study, and lack of clear guidance on how to design and conduct a feasibility study of a complex intervention (415, 416). The development of the protocol was informed by guidance and recommendations published by the MRC (194) and National Institute for Health Research (NIHR) for a feasibility study of a complex intervention (436). By focusing on feasibility outcomes, the study protocol addresses questions about whether and how the intervention can be delivered in real-world settings. The feasibility outcomes listed in the protocol are informed by contemporary literature on feasibility research pertaining to behaviour change interventions in healthcare settings. The proposed qualitative and quantitative research methods (for assessment of the feasibility outcomes) have been described as feasible and useful in previous research and were also rated as important and feasible in the local (County Durham) context by HVs who took part in the intervention development research. The feasibility study protocol can be used as part of a funding application to the NIHR Research for Patient Benefit programme, for the purpose of taking this research to the feasibility testing stage.

6.3 Rationale of using the COM-B model and BCW

Relying on a single behaviour change theory for the designing of an intervention can be a problem if that theory does not include all the relevant change processes that need to be considered (459). Also, some theories (e.g., the Theory of Planned Behaviour) may be useful in identifying important psychological and reflective behaviour processes to target for change, but they provide limited information about *how to change* behaviours (460). The comprehensive nature of the COM-B model enabled identification of all relevant behaviour change processes – internal (e.g., psychological) and external (e.g., social and practice environment) processes as well as reflective and automatic motivational processes - that needed to be targeted. It was particularly relevant to consider the automatic motivational

processes for this research because the evidence from the SR and the exploratory work with HVs at the workshops strongly suggested that the sensitive nature of the topic influenced HVs' practice behaviours. The COM-B also acted as a signpost to specific theories (e.g., the PRIME theory to understand the dynamic relationship between reflective and automatic processes of motivation) and to the theoretical domains framework when this was required. Yet, another researcher with a special interest may not see the need for a supra-theoretical model such as the COM-B but prefer to use a single theory or select components from a group of theories that are well-established in a particular context. The practice of theory integration – selecting and combining components or group of components from several different theories - has been shown to be useful for development of interventions aimed at multiple health professional behaviour change (428, 461). However, arbitrarily choosing constructs from different theories or using combinations of constructs from various theories is not recommended (462).

The COM-B analysis identified multiple behavioural change processes as relevant targets for the intervention. Targeting multiple change processes with BCTs indicated that multiple behaviour change theories may need to be involved (461). However, operationalising a number of behaviour-change theories to select BCTs can raise considerable conceptual and methodological challenges, even for experienced researchers (430). Moreover, the choice of a specific theory (or combination of theories) can have implications for the selection of BCTs (463). It is also relevant to note that not all theories specify BCTs and individual BCTs are not exclusive to specific behaviour change theories (250). On a practical level, the simplicity and the coherence of the COM-B model and the systematic guidance provided within the BCW were helpful for me.

The links between the BCW (253) and the BCT taxonomy version 1.0 (262) enabled me to implement a systematic, and logical process of selecting appropriate BCTs for the intervention. The literature suggests that many behaviour change intervention development studies (typically those that do not use the BCW) do not explicitly state the theory or theories that informed the selection of the BCTs for the intervention (463, 464). The BCTs selected for the proposed intervention are linked with various behaviour change theories and theoretical frameworks. Informed by relevant implementation science and intervention development literature (395, 401, 463-465), I have identified some key theoretical

frameworks that are associated with the BCTs included in the intervention (Table 6.1).

Table 6.1 Mapping of the BCTs to existing theoretical frameworks.

BCT description (label)	Examples of theories associated with the BCT
Problem solving (coping planning) (1.2)	Implementation Intention theory (466); Control Theory (401)
Action planning (1.4)	Health Action Process Approach (467); Control Theory (401)
Discrepancy between current and expected behaviour (1.6)	Control Theory (401)
Social support (practical) (3.2)	Information-motivation-behavioural skills model (IMB) (468)
Instruction on how to perform the behaviour (4.1)	Social cognitive theory (SCogT) (299)
Providing information about health consequences (5.1)	IMB (468); SCogT(299); Theory of Planned Behaviour (298)
Salience of consequences (5.2)	Operant Conditioning (an Action theory) (469)
Demonstration of the behaviour (6.1)	SCogT (299); Social Learning theory
Provide opportunities for social comparison (6.2)	Social comparison theory (465)
Information about other's approval (6.3)	IMB (466), TPB (298)
Use prompts/cues (7.1)	Operant conditioning theory (465)
Graded Tasks (8.7)	SCogT (299); Self-determination theory (470)
Credible source (9.1)	Integrated Behavioural Model (471); Health Belief Model(472)
Adding objects to the environment (12.5)	Operant conditioning theory (465)
Framing/reframing (13.2)	Integrated Behavioural Model(471)
Verbal persuasion of capability (15.1)	SCogT (299); Self-determination theory (470)
Focus on past success (15.3)	Self-regulatory theory (an Action theory)(469)

6.4 Contributions to the literature.

The research question addressed by this thesis is a well-recognised problem (gap in delivery of evidence-based care) in an area of health promotion and disease prevention (obesity prevention in the first 2 years of life). Obesity prevention during early years of life has recently emerged as a public health priority and gaining importance in the government's obesity prevention strategy (133). Research questions that are considered as important to stakeholders, including practitioners and commissioners of public health services, are more likely to lead to changes that are disseminated and embedded in routine practice (473). The

product of this research addresses an important research and evidence gap in the area of capacity building for healthcare professionals who have a central role in prevention of childhood obesity in the early years. The detailed description of the process of developing this intervention may be useful for researchers who are planning similar interventions using methods which align with the UK MRC guidelines for development of complex interventions.

Training interventions aimed at health professionals to improve delivery of care for obesity management demonstrate limited use of explicit behaviour change strategies (204).

Additionally, examples of collaborative approaches where health professionals are involved in development of educational interventions to support their practices for weight management are rare- a recent systematic review of reviews (204) identified only one primary study (474) where practitioners (as the intended recipients) were involved in a consultative role in the designing of a training intervention. This research addresses these gaps in the literature by providing an example of adopting an explicit process of involving HVs (as the intended end-users) and the use of the BCW system (218) to develop the content and design of a theory- and evidence-based training intervention.

More recently, researchers in England have reported development of BCT-based training interventions for midwives (394) and other practitioner groups (257, 475), medical students (395) and students in midwifery (208). Examples of theory/theoretical frameworks reported by these studies include social cognitive theory (394), the COM-B model (257), and using multiple theories (208, 395, 475). The use of the COM-B model has not been reported in development of obesity prevention training interventions for healthcare professionals. This research provides an example of how the links between the COM-B, the BCW, and the tools and guidance provided within the BCW can be systematically applied by non-specialist researchers (those from non-health psychology background) to guide the designing of a multiple behaviour change intervention.

6.5 Strengths of the research

The intervention was systematically developed, following guidance published in intervention development research literature (473, 476). Undertaking a systematic review of the existing literature prior to the intervention development work enabled an evidence-based approach to the exploratory work with HVs, to address knowledge gaps, focus on contextual issues

and prevent research waste. This structured and systematic approach allowed the integration of evidence synthesised from the literature and evidence generated from the participatory workshops during the different stages of the development process. The application of the BCW and the associated COM-B model of behaviour provided a clear framework to identify the potential mechanisms associated with desired behaviour change and to select relevant intervention functions and theory-based BCTs. While operationalising the steps of the BCW involved some degree of subjective judgement, the tools built within the BCW enabled those judgements to be made in a transparent way. However, identifying which BCT or BCT combinations were more likely to be effective for a specific behaviour was challenging because, currently, there is limited reliable empirical evidence of effectiveness of BCTs or BCT combinations (402). Although the intervention has been developed using robust methods, there is no guarantee that it will be effective. Establishing the effectiveness of the intervention in facilitating HV behaviour change and improving outcomes for children will require conducting a cluster randomised controlled trial or a similar evaluation study.

A key strength of this research was the high level of engagement of HVs (as the target recipients of the intervention) across all stages of the design of the intervention. Involvement of health professionals is recommended for designing of interventions aimed at improving their practice (369, 387). The input from HVs was critical to ensure that the design, content, and format of the intervention is acceptable and relevant to HVs and is grounded in HVs' real-world practice environment (rather than a research environment). It is widely believed that the involvement of stakeholders improves the potential for the acceptability and feasibility of the intervention, and produces benefits for researcher(s), practitioners, the research process, and research outcomes (477-480). It is relevant, nonetheless, to note that this belief is largely based on subjective evaluations of the interventions; currently, there is no empirical evidence that co-designed interventions actually improve the uptake of evidence-based practices (247, 481).

Another strength of this research is the use of an established behaviour change taxonomy (BCT taxonomy v1) (262) to select the active ingredients (the BCTs) of the intervention. This ensured that the designing process could draw on a readily available comprehensive list of theory-based BCTs and, that they were defined in a consistent manner throughout the design process (for example, during translating/operationalising the BCTs) and for the documentation of the research. Further, the use of an internationally supported taxonomy

to specify intervention content will facilitate (1) faithful delivery of the intervention protocol in practice settings; (2) research efforts to evaluate the effectiveness of the intervention; and (3) the accurate replication of the intervention by interested researchers (427).

An important aspect of this research was reporting on participants' evaluation of the co-design activities and their experiences of engaging with the research. Evaluation of co-design activities by research participants and its reporting is important because there is lack of evidence of what works best to achieve meaningful stakeholder engagement in behaviour change research (376, 482). Insights gained from this co-design approach may be useful for researchers wanting to use workshops to engage with healthcare practitioners in research.

6.6 Limitations of the research

The contents of the intervention are informed by data gathered from HVs who lead the delivery of the HCP-0-5 in County Durham. One criticism that can be levelled at this research is that the perspectives of parents of children aged 0-2 years who live in County Durham (the 'client group' of the HVs) were not sought, as additional input, to inform the contents of the intervention. Rather, the barriers and facilitators at the parent/family level were inferred from HVs' narratives. Evidence from research conducted with parents suggests that childhood obesity prevention efforts can benefit from an in-depth understanding of parental views and beliefs about infant weight gain (446) (483), the influence of contextual factors (such as household food security status, parents' education level, cultural factors) on parents' infant/child feeding decisions and practices (484), and parents' preferences about how they want practitioners to engage with them for discussions on the topic of their child's weight and weight related behaviours and practices (485).

The setting of this intervention is County Durham where 98% of the population identify themselves as British White/other White (445). In addition to the socioeconomic environment, race/ethnicity, culture, and societal factors have implications for prevention of childhood obesity. Research (446) suggests that HVs and other health professional groups who work in more ethnically and culturally diverse regions in England need to be aware of: (1) the influence of cultural and societal norms on parental perceptions of healthy child weight and on infant and child feeding practices; and (2) the culture-specific barriers that parents experience in implementing practices recommended for healthy child weight.

Supporting children and families from Black African and South Asian ethnic groups with culturally sensitive prevention and treatment interventions is vital because the prevalence of childhood overweight and obesity is highest in these ethnic groups in England (486). The proposed intervention will, in due course, need to be adapted (to be culturally competent).

6.6.1 Methodological limitations

There are knowledge gaps in participatory research (stakeholder engagement) as a methodology for designing interventions; these gaps have implications on the rigour of the methods that were employed in this research. The lack of rigorous methods for collection and analysis of data has been cited as a barrier to researchers' efforts to validate stakeholder-informed implementation interventions (247). Structured group-based workshop activities were used in this study to generate and collect data from HVs. Although the methods used in this study are widely used in participatory research approaches to design implementation interventions, they are not specified in detail in the co-design/ stakeholder engagement literature. Therefore, the manner in which these methods are operationalised for the designing of an intervention can vary between intervention developers, thus making it difficult to replicate them for the purpose of evaluating them in empirical research, in the interests of ensuring reliability and validity (240).

Exploratory work with HVs identified contextually relevant determinants of practice and related interventions. It is possible that participants may not have identified all determinants of practice and may have missed determinants that they did not prioritise. Further, the data representing HVs' perspectives may not have completely revealed the real determinants of their practice (the actual cause of their behaviours) but may rather represent attributions HVs made to rationalise their behaviours (354). Research has shown that practitioners tend to attribute barriers to organisational and societal factors and facilitators to practitioner-related factors (190). Alternative methods (for example, direct observation and/or audio-visual recording of consultations with 'clients') have been suggested to assess the barriers to and facilitators of practitioners' practice behaviours. However, it is known that individuals may modify aspects of their behaviours in response to their awareness of being observed (487). Additionally, these methods have implications for resources and may not be acceptable to practitioners or parents. For now, the use of structured group-based methods

remain a pragmatic and feasible choice for assessing determinants of health professionals' behaviours in primary care research (488).

The primary qualitative data gathered from the participatory workshops were heterogenous in nature, consisting of texts on post-it notes and flip charts and transcriptions of audio recordings. The Framework method (379) that was used to analyse this heterogenous qualitative data in this research is commonly used for thematic analysis of transcripts of semi-structured interviews in healthcare research. Although the Framework method is also considered suitable for analyses of non-interview data, there is currently little understanding and guidance about what method(s) are most suitable to combine, analyse and interpret diverse forms of primary data produced from workshop activities, to ensure that the secondary data that is produced from the analysis are reliable and valid (244).

6.7 Implications for practice and provider organisation

Firstly, this research emphasises the need for training and education for HVs (and other practitioner groups) who have a role in prevention of obesity in childhood. The findings of the systematic review that was undertaken for this research suggest that childhood obesity prevention training could strengthen HVs' role in preventing excess weight gain in 0-2 year old children and increase their awareness of the importance of their role. Skill development and training has been identified as an important training need by HVs who took part in the workshops. The need for development of training for practitioners who have a role in prevention of childhood obesity is well recognised in policy statements of the government (132) and the Institute of Health Visiting (150). Research conducted in England has shown that obesity training interventions have the potential to improve HVs' skills, competence, and confidence, and to enhance practice behaviours and health outcomes for children and families (456).

Secondly, this research emphasises the importance of a supportive policy and practice environment for promotion of healthy child weight in primary care. In addition to training needs, HVs have identified various resource needs as important facilitators of practices recommended for addressing childhood obesity. The findings of the systematic review and the co-design workshops strongly suggest that embedding guideline-recommended practices into HVs' existing routines will require organisational support for HVs' role (such as practice

tools and clear care pathways) and policies that promote a collaborative approach between different practitioner groups, offer continuity of care and address case workload (number of children for whom a HV is responsible for) size. Although challenging to implement, evidence from UK studies suggests that multifaceted interventions that address barriers at the level of the practitioner, child/parent, and the provider organisation have the potential to produce sustainable positive impact on engagement of healthcare practitioners and parents of 0-5 year olds with childhood obesity prevention efforts (389, 489).

The development of the intervention was time-consuming. In particular, HVs' involvement in the different stages of the research had implications on the use of their time; this was an important factor to account for, during the planning of the study. Additional resources will be required to refine this first draft version of the intervention before it can be tested for feasibility. Refining will require researchers to work with relevant stakeholders (e.g., HV team leaders and their service managers) and topic experts (e.g., infant and child nutrition experts, Healthy weight HV champions) (433). Further collaborative work with people with different skills sets (e.g., graphic designers and artists) will likely be required for the development of a protocol and a script for use by the intervention deliverer(s) and a training workbook and other materials for use by HVs, as the recipient group of the intervention.

The proposed intervention comes at the time of the publication of the Government's "Early Years Healthy Development" report, as part of the review into improving health outcomes from conception to age 2 (490). This report follows the publication in 2019 of the Green Paper "Advancing our health: prevention in the 2020s" in which the government identified several areas for action to address excess weight gain in 0-2 year old children, and a commitment to modernise the HV-led Health Child Programme, with increased focus on the first 1000 days of life. Although the delivery of the HCP 0-5 in County Durham has undergone several organisational and structural changes between 2017 and 2020, preventing excess weight gain in children before Reception (age 4-5 years) remains an important objective for DCC's action plan to deliver Best Start in Life (BSIL). The development of HV's professional role in prevention of childhood obesity is an important area for action within the BSIL action plan of DCC's Public Health department (212).

6.8 Researcher's reflections

6.8.1 Reflections on the subtle realist position

I understood – from my review of relevant literature on delivery of healthcare and my own previous experiences as a practitioner – that PCPs' clinical behaviours have a strong social context. The “accounts” (findings) generated by this research include not just the organisational context but also the complexity of the social context of the environment in which the clinical behaviours are performed. By applying the ontological and epistemological stance of subtle realism, I have presented a comprehensive description of childhood-obesity prevention care and guideline implementation that is context-sensitive. Implementation of guidelines has been conceptualised both as an objective, manageable reality (namely, organisational goals, performance indicators, compliance rates) and a social phenomenon populated by individuals with their subjective and/ or shared understandings of implementation of guideline recommended practices.

Compared to the organisational context, the social context of guideline implementation is less tangible and relates to the idea of “sense making” by practitioners, based upon their beliefs about their role, the perceived usefulness of the guidelines, their own goals and priorities and priorities set by service users (491). By taking a subtle realism position, I could consider multiple perspectives yet derive a single account of the current state of the preventive care practices, including suggesting potential solutions. Further, the subtle realism position offered an epistemological solution by providing a theoretical foundation for combining qualitative and quantitative research methods, and explore the shared meanings that participants held about the social context of guideline implementation. By adopting a collaborative mixed methods research approach underpinned by the subtle realist epistemological position, I have presented a description of the phenomenon of guideline implementation that is informed by multiple perspectives.

My chosen stance of subtle realism required me to provide valid and non-contradictory descriptions of the phenomenon. Validity in subtle realism research is defined as the degree of confidence (rather than certainty) that can be placed in the findings. I reflected on the strategies that were incorporated within this research, to demonstrate methodological rigour. They are outlined in Table 6.2, below. These strategies are considered as particularly

important for addressing validity and rigour in mixed methods research and research underpinned by subtle realism (230, 271).

Table 6.2 Application of quality criteria to address the validity of this research

Description	Application in this research
Triangulation: The data analysed from multiple sources (quantitative and qualitative) were triangulated to establish corroborating evidence and increase the credibility of the research findings.	Described in the Methodology chapter (2.2.3); a triangulation strategy was used throughout, to analyse and interpretation the data generated from the workshops.
Clear description of the methods of data collection and analysis.	An overview of methods is presented in the Methodology chapter (chapter 2, subsections 2.3.2 and 2.3.3); the methods used for the designing of the intervention are described in detail in relevant sections in the Intervention development chapter (chapter 4);
Researcher reflexivity; a part of reflexivity was my researcher positionality.	Described in the Methodology chapter (chapter 2, subsections 2.5.1 and 2.5.2); my reflections are presented in subsequent sections of this chapter (6.8.3 and 6.8.4)
Incorporate a wide range of perspectives: viewpoint of one group is never presented as if it represents the sole truth about any situation.	Addressed in Intervention development chapter (chapter 4, subsections 4.4.1, 4.4.2, 4.4.3 and 4.4.4); Participant sampling strategy and the planning of the workshops ensured that all HV teams could participate in at least two workshops at different stages of the intervention development. The conduct of the workshops was informed by best practice principles, to promote participation and creativity. My reflections on the conduct of the workshops are presented in subsequent sections of this chapter (specifically, 6.8.2 and 6.8.5); participants' evaluation of the workshops is presented in Appendix L.

6.8.2 Facilitation of workshops

As the researcher and the workshop facilitator, my main focus was on my ability to translate the principles of co-production (democratic processes, ethical issues, participation issues) into the practical aspects of the research (tasks for the researcher and participants, design methods for data generation, and quality of the overall process). At the workshops, I endeavoured to provide a platform on which participants could voice their perspectives,

both as individuals and as a collaborative. Individual participation was encouraged but this was monitored to ensure no one individual was either overburdened or, conversely, dominated the process. Establishment of an experienced HV (known and held in regard by the research participants) as the workshop co-facilitator created a sense of collective control over the collaborative activities and facilitated HVs' creativity.

As research participants, HVs did not participate in the formal analysis of primary data but reviewed and interpreted key findings emerging from that analysis during different stages of the designing of the intervention. Additionally, emerging data was discussed with workshop participants and their feedback was incorporated in the analysis throughout the collaborative research process. These steps facilitated mutual agreement and understanding of the emerging intervention (between participants and I as the researcher) and contributed to the methodological rigor and reliability of the research (494).

6.8.3 Researcher positionality

Throughout the collaborative research work, I engaged in reflexivity and self-reflection to consider the potential ramifications of my researcher positionality (as I perceived it) on the research process, on participants, and my analytical stance (492). From the beginning, I saw myself as occupying the position of both an insider and outsider researcher rather than just an insider or outsider (493). My insider positionality was on the basis of my prior education and training, and work experiences which provided me with substantial insider knowledge of the research topic and the professional role of health visitors. At the same time, I saw myself as an outsider because I am not a health visitor or currently employed in a frontline practitioner role in health and social care, nor a member of staff of DCC or Harrogate and District NHS Foundation Trust.

The mixed insider-outsider positionality provided the ideal situation for me because I benefited from a combination of involvement (familiarity and empathy as an insider), and estrangement (a sense of distancing as an outsider) (494). As an insider, I was familiar with the language and norms relevant to the practice behaviours. I felt more able to establish rapport with the participants, identify with genuineness of HVs' accounts, and demonstrate empathy with participants' narratives. Although this familiarity may have contributed to better access to HVs and being more accepted by them, I was aware that the insider researcher perspective could hamper my objectivity and increase the risk of making

assumptions about HVs' views and beliefs. I also considered the possibility that, although HVs may have felt more confident in my ability to represent their narratives and therefore, more willing to share their individual perspectives, they may have made assumptions and leave things unsaid or may have chosen not to elaborate because they expected that I (as an insider researcher) already knew.

One limitation of my outsider positionality was that I had limited understanding of the intricacies of the practice environment of HVs. However, the 'outsider' perspective made me feel more able to manage participants' group dynamics, be more objective and critical of the information that was presented. I considered the possibility that HVs may have viewed as someone who did not have an in-depth understanding of their situation and therefore, may have been selective regarding the information they opted to share.

On reflection, I believe I continuously negotiated both insider and outsider researcher identities. This was important because I was aware that the balance of my insider and outsider researcher identity could shift subtly over time and that, HVs too, might perceive me more of an insider than an outsider. Managing and addressing the mixed insider-outsider positionality involved a process of continuous critical reflexivity and self-reflection. This critical self-awareness was important as I was required to acutely tune-in to the perspectives and opinions of the participants and understand them and at the same time remain aware of how my own knowledge, biases and perceptions may be influencing what I was trying to understand.

6.8.4 Researcher reflexivity

An important consideration was the influence that I (as the researcher) brought to bear upon the overall research process. I was aware that, owing to my previous professional and work experiences, I had preconceived ideas about the 'problem' (gap in evidence-based practices) and potential solutions (interventions that might support HVs' professional role). I was also aware that participants' perceptions of my personal and professional identity might influence what they would be willing to share with me (489). From the start, I made it clear to participants that I have a clinician background but also explained my current role as a full time PhD student researcher.

Adopting a state of researcher reflexivity helped me to ensure that the exploratory work

that was conducted in the workshops were not structured by my own experiences or from a preconceived or imposed analytical process but rather were responsive to participants' accounts and data driven. Consciously bracketing my existing knowledge and presuppositions and adopting an attitude of: 'as the researcher, I was lacking in understanding of the lived experiences of the participants who are the experts', facilitated the collection of data that was relevant to the line of enquiry. At the same time, I reflexively used my knowledge to inform my subjective interpretations throughout the process of data collection and analysis (495).

6.8.5 Power sharing to promote participation

As the objective of the research was to design an intervention which aimed to support HVs' training needs, one bonus was that HVs (as research participants) potentially stood to benefit from the research. When all participants benefit from the research process, this can arguably reduce the inequality in benefit among the researcher and the participants. The open and transparent approach adopted in the research process possibly allowed a 'safe place' for individual perspectives to be constructed. This was critical because an important principle of subtle realism is that different voices and views are heard and considered. Participants' feedback (described in detail in the "participants evaluation of workshops" report in Appendix J) suggested that as professionals, HVs understood the importance of the research topic, valued the opportunity to take part in the research, and appreciated that their role in childhood obesity prevention and as participants in this research was recognised and valued.

6.9 Further research

The MRC framework recommends conducting an exploratory study (e.g., a feasibility study) to address issues concerning the optimisation, acceptability, and delivery of a complex intervention (194). The existing draft version of the intervention will need to be further optimised iteratively and collaboratively with stakeholders, prior to a formal feasibility study. A protocol for a feasibility study of the intervention is presented in chapter five. The protocol could be used as part of a funding application to the NIHR Research for Patient Benefit Programme. The findings of the proposed study could be used to (1) improve the structure and content of the intervention and identify measures that may be required to be implemented, to refine the form of delivery; and (2) inform the rationale to proceed (or not)

to the next step in the process: namely, a pilot study (a miniature version of the main trial), to test aspects of study design and processes for data collection and evaluation, and to inform a larger main trial in the future.

6.10 Implication of the ongoing COVID-19 pandemic on childhood obesity

6.10.1 Implications for delivery of an in-person training intervention

One of the earliest impacts of the COVID-19 pandemic was that all organisations in England (and in the UK) postponed and/or cancelled in-person group meetings. Consequently, all in-person capacity building interventions of healthcare staff through workplace learning programmes have been on hold. Health and social care provider organisations are increasingly using digital solutions to deliver and access training, as far as is practical. The government's roadmap to ease Covid-related lockdown restrictions suggests that there is a possibility that organisations will be able to safely re-introduce face-to-face training by late July 2021. If restrictions on in-person group meetings continue to be in place for the foreseeable future, it will be relevant to consider an online mode of delivery of this intervention. Virtual training programmes have become increasingly popular due to the availability of newer interactive and collaborative web-based technology (496). Although a lot of progress has been made in developing effective web-based interventions, translating this multi-component intervention which has many interactive elements into a web-based intervention is likely to present challenges (497). One option could be to take a blended approach to deliver the intervention. Blended approaches to delivery of training for health professionals have become popular (498). In this mode of delivery (hybrid learning), there is opportunity for face-to-face activities, and also web-based dynamic digital activities and content that help reinforce learning and enable access to those who cannot attend face-to-face training for any reason.

6.10.2 Impact of the COVID-19 pandemic on childhood obesity

Latest figures (released October 2020) from PHE indicate that the prevalence of obesity in children aged 4-5 years has increased from 9.7 % in 2018-19 to 9.9% in 2019-2020 (24). There is emerging evidence to suggest that quarantine measures imposed to control the pandemic are affecting pre-school children's eating, physical activity and screen time behaviours (499, 500), and increasing the risk of excessive weight gain (501). These findings emphasise that prevention of childhood obesity is now more important than ever, with the

need for local authorities to remain focused on a whole system approach to prevent obesity at the individual, community, and population level. However, the reality is that prevention of childhood overweight is unlikely to be viewed as a priority concern in the current situation by staff and healthcare provider organisations (502). The COVID-19 pandemic, NHS England's prioritisation of community health services, and the lockdown restrictions have adversely impacted already strained health visiting services. A report on the impacts of COVID-19 on health visiting in England has highlighted significant pressures on the health visiting workforce and services (502). This report has identified several important issues including reduction in size of HV teams, increased case load size, decrease in number of face-to-face contacts with vulnerable children and families, and adverse effects on staff wellbeing. Moreover, HVs are expecting a surge in demand for support due to the secondary impacts of the pandemic. Without provision of adequate organisational support, HVs are likely to focus their efforts and limited resources to safeguarding and protecting vulnerable children from risk of neglect and abuse (503).

6.11 General conclusion

The work presented in this thesis has addressed an identified gap in the literature by developing a complex theory-informed intervention aimed at HVs to support their implementation of guideline recommended practices for prevention of obesity in 0-2 year old children. In compliance with the MRC framework on development of complex interventions, a theory-based intervention has been systematically developed, informed by the best available evidence, consultative work with HVs, and guidance from the BCW. Multiple determinants (barriers and facilitators) of HVs practices were identified and mapped to the subcomponents of the COM-B model. Key behavioural target domains were identified and linked to multiple intervention functions and behaviour change techniques that could be practically delivered as a coherent interactive training intervention. The end-product of this thesis is the first draft of the intervention which will need to be refined (optimised) prior to feasibility testing in the local context. Future research will involve conducting a feasibility study of the intervention to test the feasibility of the delivery of the intervention as planned and intended, and its acceptability and suitability to HVs. With increasing prevalence of overweight and obesity in children, strengthening HVs' role in promoting healthy weight gain in children aged 0-5 years is an important area for action in

the whole system approach to address obesity. Therefore, research to develop theory-based training interventions for HVs to enhance their capacity to use evidence-based, culturally sensitive communication strategies during their interactions with children and families is highly relevant. Traditional training interventions (not theory-informed) are limited in their potential for effectiveness. This research adds to the body of evidence on using health psychology-informed obesity training interventions for healthcare practitioners and the broader literature on BCT-based implementation interventions designed for improving quality of healthcare.

For HVs to effectively support parents/carers as agents of change for prevention of excess weight during early years of life, they will benefit from an in-depth understanding of parental views and beliefs and their preferences regarding how weight related communication is managed. Future research to support HVs' implementation of guideline recommended practices should consider allocating sufficient time and resources to incorporate parental perspectives in the development and optimisation of the intervention targeted at HVs. The intervention will need to be optimised through limited feasibility testing prior to considering a cluster randomised pilot trial, to explore the feasibility of delivery and evaluation before any decision can be made about a definitive trial study.

Appendix A- Reporting of the Mixed Methods research using the GRAMMS checklist.

(GRAMMS= Good Reporting of A Mixed Methods Study)

1. Describe the justification for using a mixed methods approach to the research question
This research aimed to design a behaviour change intervention. Both quantitative and qualitative methods were used to develop a comprehensive understanding of various processes of intervention development. The use of mixed methods was critical to assess context, determinants of practice behaviours, and to explore the potential feasibility and acceptability of the emerging intervention.
2. Describe the design in terms of the purpose, priority, and sequence of methods
<p>The overarching purpose of the mixed methods research was to design a complex intervention for health visitors. The purpose of using mixed methods was to understand complex phenomena (barriers and facilitators to implementation of recommended practices; beliefs and views about importance, acceptability, and feasibility of the emerging intervention).</p> <p>The quantitative and qualitative strands were used concurrently; this was determined by the framework that was used to guide the stepwise designing of the intervention. Both strands had equal emphasis.</p>
3. Describe each method in terms of sampling, data collection and analysis
<p>Sampling for both qualitative and quantitative methods was purposive to ensure representativeness of views and experiences of health visitors (HVs) who worked in different areas within the research site.</p> <p>Data collection:</p> <ul style="list-style-type: none">Quantitative: individual participant's rating of items (e.g., for importance, relevance, acceptability); cards with Likert type scales and dot voting technique were used to collect data.Qualitative: small group discussions followed by feedback (audio recordings); textual data on flip chart sheets, cards, post-it notes <p>Data analysis:</p> <ul style="list-style-type: none">Quantitative: descriptive statistics (proportions and frequencies) used to summarise quantitative data generated from different dot voting activitiesQualitative: Framework Method was used to conduct thematic analysis (378).

4. Describe where integration has occurred, how it has occurred and who has participated in it
<p>Where appropriate, the analysis of the quantitative data representing participants' views of rating for relevance (or non-relevance) of items, acceptability, and feasibility (in the local context) were 'triangulated' with the concepts and themes identified from the thematic analysis of the qualitative data, to establish corroboration of the evidence from two sets of data. The results from the analyses were grouped together into "findings" to inform the specific stages of the development of the intervention.</p> <p>Participants at the workshops engaged in the activities and provided their insights of the relevance and potential implications of the findings in the context of their own practice. Although participants' actions were not identified formally as "data analysis", analytic activity was implicit in the interpretation work that was performed by participants at the workshops as we progressed through the different stages of the intervention development.</p>
5. Describe any limitation of one method associated with the presence of the other method
<p>I did not identify any limitation of one method as a result of the presence of the other method.</p> <p>Potential limitations of the quantitative method (dot voting for rating of items) were avoided/ minimised by using only individual dot voting and not group voting.</p> <p>Potential limitations of the qualitative method (they were likely those known to be associated with research involving focus groups: ethical issues around conducting workshops with participants who have pre-existing power relationships in their workplace; individual views may not have represented a true account of the person's view especially on sensitive topics; possibility of participation bias</p>
6. Describe any insights gained from mixing or integrating methods
<p>Using mixed methods provided rich, detailed, and comprehensive understanding of (1) factors that influence practice behaviours of health visitors; and (2) importance and relevance of items in the local context. Using only qualitative or only quantitative methods could not have generated the understandings that were required to achieve the objectives of the research. It was critical to corroborate the quantitative data (individual dot voting for rating of items) with qualitative data (participants' views and opinions) at different stages of the development of the intervention, to design an intervention that is likely to be acceptable and feasible in local context.</p>

Appendix B- Reporting of the Systematic Review using the PRISMA checklist (PRISMA 2009)

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	53
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable	Summary not included in thesis
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	52-54
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	54
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	Yes; 55
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	55-57
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	57-58; 62; 207-208
Search	8	Present full electronic search strategy for at least one database, such that it could be repeated.	208-209
Study selection	9	State the process for selecting studies (i.e., screening, eligibility) included in systematic review	58-59
Data collection process	10	Describe method of data extraction from reports and any processes for obtaining and confirming data from investigators.	59-60
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	56, 60
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies and how this information is to be used in any data synthesis.	59
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	Not applicable

Section/topic	#	Checklist item	Reported on page #
Synthesis of results	14	Describe the methods of handling data and combining results of studies	60-61
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	Not applicable
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	Not applicable
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	62-63
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	218-223
Risk of bias within and across studies	19	Present data on risk of bias of each study and across the different studies, if available, any outcome level assessment (see item 12).	224-231
Synthesis of results	20	Mapping of the barriers and facilitators, illustrations (participants' quotes) mapped on to components of the selected theoretical framework for this study.	67-88
Additional analysis	21	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	Not applicable
DISCUSSION			
Summary of evidence	22	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	88-89; 92-93
Limitations	23	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	91-92
Conclusions	24	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	93-94
FUNDING			
Funding	25	Describe sources of funding and other support	33; funded PhD research

Appendix C - Systematic Review search strategy

1. Table showing sets of key concepts of the review question.

Set 1 (Health topic)	Set 2 (Phenomenon being examined)	Set 3 (Guideline recommended behaviours)	Set 4 (Determinants of behaviours)	Set 5 (Target population: primary care practitioners)
Child Pre-school child Baby; Infant Toddler Childhood obesity Childhood overweight Excess weight in children Prevention of obesity/ overweight/ excess weight in childhood Body weight Child body mass index	Practice guidelines Policy Protocol Guidance Adherence Fidelity Compliance Implement Barriers; issues; challenges; inhibitors Facilitators; enablers; motivator	Discuss/raise topic of weight Counsel/counselling Advice Engage Weight/BMI assessment/ monitoring Breastfeeding advice Infant feeding Infant diet Infant nutrition Physical activity Sleep patterns Responsive feeding Weaning/ complementary foods Portion size Screen time TV viewing time Sedentary activity	Attitude Perception/ perspective Role Opinion Behaviour View Viewpoint Beliefs Knowledge Understanding Experience	Healthcare professional Healthcare personnel Community nurse Public health nurse Doctor General practitioner Paediatrician Paediatric doctor/ nurse Family practitioner Nurse practitioner Child health services Health visitor Primary care Community health centre Maternal and child health services

2. Table showing information of the searches carried out in March 2018

Database	Database platform	Search date	Search timeframe	Number of records retrieved
Medline	Ovid	30/3/18	1/1/2002 to 31/3/2018	1077
EMBASE	Ovid	30/3/18	1/1/2002 to 31/3/2018	980
PsycINFO	Ovid	30/3/18	1/1/2002 to 31/3/2018	655
CINAHL	EBSCOHOST	30/3/18	1/1/2002 to 31/3/2018	543
British Nursing Index	PROQUEST	12/3/18	1/1/2002 to 31/3/2018	1455

3. Table showing information of the searches carried out in April 2021

Database	Database platform	Search date	Search timeframe	Number of records retrieved
Medline	Ovid	23/4/2021	1/4/2018 to 21/4/2021	306
EMBASE	Ovid	23/4/2021	1/4/2018 to 21/4/2021	451
PsycINFO	Ovid	23/4/2021	1/4/2018 to 21/4/2021	141
CINAHL	EBSCOHST	23/4/2021	1/4/2018 to 21/4/2021	142
British Nursing Index	PROQUEST	23/4/2021	1/4/2018 to 21/4/2021	319

The MEDLINE search strategy

1. (Child* adj2 (Obesity or overweight)).mp.
2. ((infant or toddler or baby) adj2 (obesity or overweight or excess weight)).mp.
3. (bodyweight or body weight or body-weight).ab,ti.
4. ((child* adj3 body mass index) or bmi).ab,ti.
5. (weight adj3 (gain or maintenance or management)).ab,ti.
6. ((prevent* or manage) adj3 (childhood obesity or obesity in children or childhood overweight or overweight in children)).ab,ti.
7. ((Guidance* or guideline* or recommended or recommendation* or advice or advised or standard\$ or statement or consensus or policy or policies or protocol*) adj10 (implement* or aware* or uptake or up-take or takeup or take-up or adhere or adherence or concordance or accordance or fidelity or adopt* or comply or compliance)).mp.
8. (barrier* or difficulty or difficulties or issues or challenges or facilitat* or enablers or motivators).ab,ti.
9. "Attitude of Health Personnel"/ or Health Knowledge, Attitudes, Practice/ or "Surveys and Questionnaires"/ or Health Personnel/
10. Communication/ or Professional-Family Relations/ or parent-nurse communication.mp.
11. (perception* or opinion* or experience* or insight* or understand* or belief* or knowledge or behavior?r or role* or view or view-point or point of view or role*).ab,ti.
12. Quality Improvement/ or Professional Practice/ or "Attitude of Health Personnel"/ or Primary Health Care/ or Obesity/ or Health Personnel/
13. (behaviour* or behavior* or behaviour* change or behaviour* change).ab,ti.
14. (weight monitoring adj10 (child* or infant or baby or babies or toddler*)).ab,ti.
15. responsive feeding.ab,ti.
16. ((advice or counsel) adj5 breastfeeding).ab,ti.
17. ((discuss or advice) adj10 (bottlefeeding or bottle-feeding or formula feeding)).mp.
18. ((discuss* or talk* or "rais* the topic" or advice) adj10 (infant weight or child weight or toddler weight)).ab,ti.
19. ((discuss* or talk* or advice*) adj10 (infant sleep or baby* sleep or toddler sleep)).ab,ti.

20. ((discuss* or talk* or advice*) adj10 (physical activity or play)).ab,ti.
21. ((discuss* or talk* or advice*) adj10 (weaning or complementary feeding)).ab,ti.
22. ((discuss* or advice*) adj10 (healthy diet or nutrition)).ab,ti.
23. ((discuss* or talk* or advice*) adj10 portion size*).ab,ti.
24. (healthcare professional or health care professional or health professional).ab,ti.
25. ((child health care or nurse or family or general) adj3 (provider or practitioner*)).ab,ti.
26. ("public health" or "community health" or "community") adj3 nurse*).ab,ti.
27. (doctor or p\$ediatric*).ab,ti.
28. (child health service* or child* health cent\$r* or well-baby clinic or primary care or community cent\$r* or community health cent\$r*).ab,ti.
29. ((home or health) adj3 visitor).ab,ti.
30. 1 or 2 or 3 or 4 or 5 or 6
31. 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23
32. 7 and 8
33. 9 or 10 or 11 or 12 or 13
34. 31 or 32 or 33
35. 24 or 25 or 26 or 27 or 28 or 29
36. 30 and 34 and 35
37. limit 36 to (english language and humans and yr="2002 -Current" and ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)"))

Appendix D – Critical appraisal tools used for the Systematic Review research

1. Critical appraisal tool for Quantitative (survey) studies and Quantitative component of Mixed methods studies)

(Adapted from the JBI tool for prevalence studies)

Source: [https://joannabriggs.org/sites/default/files/2019-05/JBI Critical Appraisal-Checklist for Prevalence Studies2017 0.pdf](https://joannabriggs.org/sites/default/files/2019-05/JBI%20Critical%20Appraisal-Checklist%20for%20Prevalence%20Studies2017%200.pdf)

[Y=Yes; N=No; U=Unclear/ not known; NA= Not applicable)

Reviewer: _____		Date: _____			
Study author: _____		Year: _____		Study ID: _____	
Journal: _____					
Quality criteria	Response				
	Y	N	U	NA	
Q 1. Was the sample frame appropriate to address the target population? (Did it include almost all the members of the target population, to address the study's objectives?)					
Q 2. Were study participants recruited in an appropriate way? (How was the sampling performed?)					
Q 3. Is there evidence that the authors conducted a sample size calculation to determine an adequate sample size					
Q 4. Were the study subjects and the setting described in detail?					
Q 5. Were valid methods used for the measurement of the outcomes?					
Q 6. Were the outcomes measured in a standard, reliable way for all participants?					
Q 7. Was the questionnaire adequately piloted in terms of the method and means of administration, on people who were representative of the study population?					
Q 8. Was the response rate reported? (were details reported of participants who were unsuitable or did not take part?)					
Q 9. Have any potential biases (including response bias) been discussed?					
Q 10. Were the methods used to analyse the data appropriate? (e.g., correct statistical tests, qualitative analysis for any open ended questions)					

Overall appraisal:

Comments:

2. JBI Critical Appraisal checklist for Qualitative studies and Qualitative component of Mixed Methods studies

Source: [http://joannabriggs-webdev.org/assets/docs/critical-appraisal-tools/JBI Critical Appraisal-Checklist for Qualitative Research2017.pdf](http://joannabriggs-webdev.org/assets/docs/critical-appraisal-tools/JBI%20Critical%20Appraisal-Checklist%20for%20Qualitative%20Research2017.pdf)

Reviewer: _____		Date: _____		
Study author: _____		Year: _____		
Journal: _____		Study ID: _____		
Quality criteria	Responses			
	Yes	No	Unclear	Not applicable
1. Is there congruity between the stated philosophical perspective and research methodology?				
2. Is there congruity between the research methodology and the research question or objectives?				
3. Is there congruity between the methodology and the methods used to collect data?				
4. Is there congruity between the methodology and the representation and analysis of data?				
5. Is there congruity between the methodology and the interpretation of results?				
6. Is there a statement locating the researcher culturally or theoretically?				
7. Is consideration given to how findings relate to researchers' influence, e.g., relationship between researchers and participants?				
8. Are participants and their voices (quotes), adequately represented in the findings?				
9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?				
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?				

Overall appraisal

Comments:

Appendix E – Data extraction forms used for the Systematic Review research

1. Data extraction form for Quantitative data: Survey studies and Quantitative component of Mixed methods studies.

(Adapted from the JBI data extraction form for prevalence studies:

<https://wiki.jbi.global/display/MANUAL/Appendix+5.2%3A+Data+extraction+form+for+prevalence+studies>)

Reviewer: _____	Date
Author of study: _____	Year
Journal: _____	Study ID: _____
Study description	
Research question/objectives	
Location of study:	Year(s) during which study was conducted:
Target population (participants)	(Note: if patients or other groups were also included in the study, only data relevant for healthcare professionals will be extracted):
Setting:	
Study design	
Data collection tool(s)	
Outcomes	
Outcomes measures	
Description of sampling and/or recruitment strategy;	
Inclusion and exclusion criteria	
Sampling size justification (if provided)	
Study participants	
Sample size and response rate	
Participant characteristics (e.g., professional role, demographics, experience, patient group)	
Data analysis	
Methods (statistical analyses) used:	
Descriptive statistics (means and frequency tables)	
Results	
Include table numbers and page numbers from publication	

Reviewer's comments:

2. Data extraction form for Qualitative data: Qualitative studies and Qualitative component of Mixed Methods studies

(Adapted from the JBI data extraction form for qualitative studies:

<https://wiki.jbi.global/display/MANUAL/Appendix+2.3%3A+JBI+Qualitative+data+extraction+tool>)

Reviewer _____	Date _____				
Author of study _____	Year _____				
Journal _____	Study ID: _____				
Study description					
Research question/objectives:					
Location of study:	Year(s) during which study was conducted:				
Target population (participants) (Note: if patients or other groups were also included in the study, only data relevant for healthcare professionals will be extracted):					
Methodology:					
Phenomenon of interest:					
Setting					
Theoretical approach:					
Data collection					
Method (e.g., interview, focus group; participants' notes)					
Tools used (e.g., interview schedules, audio recordings; open ended questionnaire included with survey)					
Type of data collected (e.g., verbatim transcripts, participants' notes)					
Study participants					
Sample size (including attrition, if any)					
Participants' characteristics (e.g., professional role, demographics, experience, patient group)					
Data analysis					
Method (e.g., thematic analysis, data triangulation)					
Findings					
Main themes	Description of theme (and subthemes)	Illustrations (quotes) from publication (with page number)	Evidence		
			Unequivocal	Credible	Unsupported

Reviewer's comments:

Appendix F - List of excluded studies following full text screening

A. Studies that were excluded following full text screening conducted as part of the search for updating the review (searches ending 3rd week, April 2021)

1. van der Maas JC, Corbee RJ, Kroese FM, de Ridder DTD, Vos RC, Nielen M, et al. Discussing overweight in children during a regular consultation in general practice: a qualitative study. BMC Family Practice. 2020;21(1):1-8.

Reason for exclusion: study investigated primary care practitioners' perceived barriers to management of overweight in children aged 4-12 years

2. Hyer S, Edwards J. Weight Management Practices Among Florida Nurse Practitioners: A Cross-Sectional Study. The Journal for Nurse Practitioners. 2020;16(2):131-5

Reason for exclusion: study explored management of persons (most likely adult population but this could not be confirmed with certainty) with obesity.

3. Mazza D, McCarthy E, Carey M, Turner L, Harris M. "90% of the time, it's not just weight": General practitioner and practice staff perspectives regarding the barriers and enablers to obesity guideline implementation. Obesity Research & Clinical Practice. 2019;13(4):398-403.

Reason for exclusion: study explored views of practitioners regarding barriers and facilitators of implementation of practices recommended for management of obesity (adults and children).

4. Darling KE, Fahrenkamp AJ, Ruzicka E, Levitt M, Broerman L, Sato A. Provider perceptions of pediatric obesity management in clinical practice. Children's Health Care. 2019;48(1):90-102.

Reason for exclusion: study explored paediatricians' management of children with obesity.

5. Tilenius H. Childhood obesity: a challenge for primary care teams. British Journal of General Practice. 2018;68(667):90-1.

Reason for exclusion: Not primary research. The paper is a 'debate and analysis' report.

6. Sakarya S, Unalan PC, Tursun N, Ozen A, Kul S, Gultekin U. Family physicians' views on their role in the management of childhood obesity: a mixed methods study from Turkey. European Journal of General Practice. 2018;24(1):229-35.

Reason for exclusion: Study focus was on management of children aged 5 to 15 years who were overweight or obese.

7. Rhee KE, Kessl S, Lindback S, Littman M, El-Kareh RE. Provider views on childhood obesity management in primary care settings: a mixed methods analysis. BMC Health Services Research. 2018;18(1):1-10.

Reason for exclusion: study investigated management of children who were already with overweight/obesity

8. Baldassarre ME, Di Mauro A, Pedico A, Rizzo V, Capozza M, Meneghin F, et al. Weaning time in preterm infants: An audit of Italian primary care paediatricians. Nutrients. 2018;10(5):616.

Reason for exclusion: this study investigated care (providing nutritional advice) provided by paediatricians for prematurely born infants.

B. Studies that were excluded following full text screening of papers that were identified as part of the *original search conducted in March 2018*:

1. O'Donnell, J. E., et al. (2017). "General practice views of managing childhood obesity in primary care: a qualitative analysis." JRSM Open **8**(6): 2054270417693966.

Reason for exclusion: the study addressed management of overweight and obese children.

2. Gies, I., et al. (2017). "Early childhood obesity: a survey of knowledge and practices of physicians from the Middle East and North Africa." BMC Pediatrics **17**(1): 115

Reason for exclusion: Unable to confirm that the practice setting was primary care (majority were paediatricians, some worked in paediatric subspecialties) and if there were any published guidelines in the countries where the physicians worked.

3. Schalkwijk, A. A. H., et al. (2016). "Health care providers' perceived barriers to and need for the implementation of a national integrated health care standard on childhood obesity in the Netherlands – a mixed methods approach." BMC Health Services Research **16**(1): 83.

Reason for exclusion: the study addressed management of overweight and obese children.

4. Bocca, G., et al. (2016). "Dutch healthcare professionals inadequately perceived if three- and four-year-old preschool children were overweight." Acta Paediatrica **105**(10): 1198-1203.

Reason for exclusion: Study aims did not address this SR's objectives; participants included non-healthcare professionals and non-primary care settings (hospitals).

5. Avis, J. L., et al. (2016). "Tools and resources for preventing childhood obesity in primary care: A method of evaluation and preliminary assessment." Patient Education and Counseling **99**(5): 769-775.

Reason for exclusion: study aims did not meet the inclusion criteria; the study evaluated the suitability and effectiveness of tools and resources that primary healthcare providers use in their practices related to prevention of childhood obesity. The study did NOT explore providers' use of these tools or factors influencing their usage of the tools and resources.

6. Hegedus, J. and J. Mullan (2015). "Are we adequately providing support services for optimal infant nutrition in Australia? A study in regional NSW." Australian Journal of Primary Health **21**(3): 293-298.

Reason for exclusion: the study participants were managers of healthcare services.

7. Mazur, A., et al. (2013). "Childhood obesity: knowledge, attitudes, and practices of European paediatric care providers." Pediatrics **132**(1): e100-e108.

Reason for exclusion: the study topic addressed management of childhood obesity.

8. Spencer, R. L., et al. (2010). "Practice improvement, breastfeeding duration and health visitors." Community Practitioner: The Journal of the Community Practitioners' & Health Visitors' Association **83**(9): 19-22.

Reason for exclusion: the report is an opinion paper and not primary research study.

9. Hughes, C. C., et al. (2010). "Barriers to obesity prevention In Head Start." Health Affairs **29**(3): 454-462.

Reason for exclusion: study participants were not healthcare practitioners; the study explored perspectives of programme directors and managers.

10. Dorsey, K. B., et al. (2010). "Applying practice recommendations for the prevention and treatment of obesity in children and adolescents." Clinical Pediatrics **49**(2): 137-145.

Reason for exclusion: This study described the results of a quality improvement project aimed at improving weight management practices in a health care centre.

11. Small, L. et al. (2009). "Pediatric nurse practitioners' assessment and management of childhood overweight/obesity: results from 1999 and 2005 cohort surveys." Journal of Pediatric Healthcare **23**(4): 231-241.

Reason for exclusion: the study addressed management of childhood obesity.

12. Pagnini, D., et al. (2009). "The weight of opinion on childhood obesity: recognizing complexity and supporting collaborative action." International Journal of Pediatric Obesity **4**(4): 233-241.

Reason for exclusion: the focus was management of overweight and obesity in children; also, majority of the participants were not healthcare professionals

13. Huang, J. S., et al. (2009). "Pediatricians' weight assessment and obesity management practices." BMC Pediatrics **9**: 19.

Reason for exclusion: the study focus was on management of children with obesity.

14. Franc, C., et al. (2009). "French pediatricians' knowledge, attitudes, beliefs towards and practices in the management of weight problems in children." Health Policy **91**(2): 195-203.

Reason for exclusion: the study focussed on management of overweight and obese children.

15. Boyle, M., et al. (2009). "Health care providers' perceived role in changing environments to promote healthy eating and physical activity: baseline findings from health care providers participating in the healthy eating, active communities program." Pediatrics **123** Suppl **5**: S293-S300.

Reason for exclusion: the study addressed prevention of obesity in school aged children.

16. Furber, C. M. and A. M. Thomson (2008). "Breastfeeding practice in the UK: midwives' perspectives." Maternal & child nutrition **4**(1): 44-54.

Reason for exclusion: setting was not primary care; it was maternity hospitals.

17. King, L. A., et al. (2007). "Australian GPs' perceptions about child and adolescent overweight and obesity the Weight of Opinion study." Br J Gen Pract **57**(535): 124-129.

Reason for exclusion: the study addressed management of childhood obesity.

18. Flower, K. B., et al. (2007). "Using body mass index to identify overweight children: barriers and facilitators in primary care." Ambulatory Pediatrics **7**(1): 38-44.

Reason for exclusion: the study investigated practitioners' use of BMI as part of management of overweight children.

19. Jefferson, A. (2006). "Breaking down barriers -- examining health promoting behaviour in the family. Kellogg's Family Health Study 2005." Nutrition Bulletin **31**(1): 60-64.

Reason for exclusion: participants were not healthcare professionals.

20. Perrin, E. M., et al. (2005). "Preventing and treating obesity: pediatricians' self-efficacy, barriers, resources, and advocacy." Ambulatory Pediatrics **5**(3): 150-156

Reason for exclusion: study topic was management of children who are overweight or obese.

21. Spear, H. J. (2004). "Nurses' attitudes, knowledge, and beliefs related to the promotion of breastfeeding among women who bear children during adolescence." Journal of Pediatric Nursing **19**(3): 176-183.

Reason for exclusion: only 15% of the participants of this study meet the inclusion criteria of this review; majority were hospital-based specialist staff; it was not possible to separate data pertaining only to eligible participants.

22. Story, M. T., et al. (2002). "Management of child and adolescent obesity: attitudes, barriers, skills, and training needs among health care professionals." Pediatrics **110**(1): 210-214.

Reason for exclusion: study topic was management of children who are overweight or obese

Appendix G – Characteristics of the included studies

Table showing characteristics of the included studies (n=50); the studies are listed in the order of their publication date, from most recent to oldest. The rows are colour coded to highlight the different study designs that were included in the review: quantitative (survey studies) ; qualitative ; and mixed-methods

A. Studies included for the review update (n=5); searches conducted 3rd week April 2021

Author; Year, Country	Participants characteristics; sample size	Study aim	Data collection method(s)	Service user group	Primary care setting/context	Theory/model referred to	Analysis methods
Andersen; 2020; USA (188)	PEDs, NP, PNP; PA; n=20	Explore PCPs' perspectives on evaluating and communicating about early excessive weight gain and to identify PCP-opined barriers	Semi-structured interviews	0-5 years	Well child visits	None	Thematic analysis
Cheng; 2020; Australia (310)	Child and Family Health nurses (CFHNs); survey, n = 90; interview, n=20	Examine factors influencing the child obesity prevention practices of CFHNs	Survey questionnaire; semi-structured interviews	0-5 years	Maternal and child health service	None	Descriptive statistics; thematic analysis
Belay; 2019; USA (312)	PEDs; n= 1805; (655 from 2006, 592 from 2010, 558 from 2017)	Compare paediatricians' practices and attitudes regarding BMI assessment and obesity prevention in children ≥ 2 years in 2006, 2010 and 2017	Routine national surveys of AAP members	2-17 years	Well child clinics	None	Descriptive statistics; various statistical tests
Moir; 2019; New Zealand (324)	Maternal and Child Health (MCH) nurses; n=33	Experiences of conducting the mandatory BMI assessment as part of routine before school check	Focus groups	4 year olds	Before school check (B4SC) clinic	None	Thematic analysis
Kracht; 2019; USA (325)	Nurses, physicians, dietitians); n=20	Develop an understanding of how PCPs perceive their role in the obesity prevention and healthy development of young American Indian children.	Semi-structured Interviews	0-5 years	Primary care clinics (including government funded clinics)	None	Thematic analysis

Abbreviations: BMI = Body mass index; *PCP* Primary care practitioner; *PEDs* Paediatricians; *NP* Nurse practitioners; *PA* Physician assistant; *PNP* Paediatric Nurse practitioners

B. Studies (n=45) included in the original review (searches conducted in March 2018)

Study author; Year, Country	Participants characteristics; sample size	Study aim	Study design and data collection methods	Service-user group	Primary care setting/context	Theory/model referred to	Analysis methods
Tanda; 2017; USA (316)	Nurse practitioners (NPs); n=155;	Investigate NPs' knowledge (about obesity and guidelines); practice patterns; personal physical activity practices; perceived barriers	Survey questionnaire (With open ended questions)	2-17 years	Primary care clinics affiliated to hospitals	None	Descriptive statistics; various statistical tests; Content analysis of text data
Dera-de Bie; 2016; Netherlands (321)	GPs and Child Health Centre (CHC) nurses (n= 216);	Identify primary care providers' (PCPs') behavioural and personal characteristics that influence overweight prevention	Survey questionnaire	0-4 years	Child health centres	Model of determinants of innovation processes (296)	Descriptive statistics; various statistical tests
Nordstrand; 2016; Norway (345)	Public Health Nurse (PHN); n=18.	Explore how PHNs perceive the implementation of national guidelines	Semi-structured interviews	0-5 years	Well-baby clinics	Implementation Change Model (192)	Thematic analysis
Ditlevsen; 2016; Denmark (346)	General practitioners (GPs) and health visitors (HVs); n=19; 10 GPs and 9 HVs	Investigate structural barriers to implementation at individual level	Semi-structured interviews	3-5 years	Services delivered by GPs and local authority	Bacchi's account of policy analysis (297)	Thematic analysis
Bourgeois; 2016; Canada (336)	Clinicians and nurses; n= 40	Determine perspectives of PCPs (and parents): facilitators and barriers to and recommendations for implementing a prevention program in primary care	Focus groups	2-5 years	Family Health centres	None	Content analysis
Nelson; 2015; USA (334)	PEDs; FPs; NPs; PAs; n=656; (265 PEDs, 143 FPs, and 248 NP/PAs	Assess and compare weight management related counselling perceptions and practices; perception of top 3 barriers and top 3 training needs/resources	Survey questionnaire	Included 0-5-year age group	Paediatric care practices	None	Descriptive statistics; various statistical tests
McLelland; 2015; Australia (328)	Maternal and child health nurses; n=17 (12 nurses, 5 domiciliary midwives)	Explore views about factors that influence breast feeding (BF) practices; focusing on how to support breastfeeding mothers	Focus groups	Breast-feeding mothers	Community based home visiting services in one region	None	Thematic analysis
Laws; 2015; Australia (280)	Maternal and child health (MCH) nurses; survey, n=56; interviews, n= 16	Examine MCH nurses' child obesity prevention practice; factors influencing such practices	Survey questionnaire; semi-structured interviews	0-5 years	Maternal and child health service	None	Descriptive statistics; thematic analysis
Chelva-kumar; 2014; USA (317)	Physicians; physician assistants; NPs; n=69	Assess PCPs' perception and documentation of their adherence to guidelines for paediatric obesity prevention and assessment	Survey questionnaire; retrospective chart review	2-18 years	Paediatric care practice	None	Descriptive statistics; Descriptive analyses of scanned chart data

Study author; Year, Country	Participants characteristics; sample size	Study aim	Study design and data collection methods	Service-user group	Primary care setting/context	Theory/model referred to	Analysis methods
Pound; 2014; Canada (329)	Primary care physicians; n= 780; (397 PEDs; 322 FPs; 61 resident doctors);	Assess breastfeeding knowledge, confidence, beliefs, and attitudes of Canadian physicians	Survey questionnaire	Not relevant	Paediatric care practice	None	Descriptive statistics; various statistical tests
Bonnet; 2014; USA (335)	Physicians, PAs, NPs; n=56 (41 physicians, 8 PAs & 7 NPs)	Examine barriers for preventing and treating paediatric obesity and practice related behaviours	Survey questionnaire	0-5 years	Family Medicine practice clinics	None	Descriptive statistics
Lowenstein; 2013; USA (341)	Physicians; NPs; PAs; n=123	Explore the relationship of providers' self-efficacy, outcome expectations, and practice characteristics	Survey questionnaire	3-8 years	Paediatric & family medicine practice; in rural and suburban areas	Social cognitive theory (299)	Descriptive statistics; various statistical tests
Robinson; 2013; Australia (344)	General practice nurses; survey, n=59; interviews, n=10	Explore current practice, attitudes, confidence, and trainings needs of nurses surrounding child obesity prevention	Survey questionnaire; semi-structured interviews	Child's 4-year review	General practice	Theory of planned behaviour (298)	Descriptive statistics, statistical tests; thematic analysis
Ljungkrona-Falk; 2013; Sweden (323)	Child health centre nurses; surveys, n= 62; three focus groups, n= 17)	Describe perceived barriers when discussing with parents food habits, physical activity, and their child's body weight	Focus groups followed by survey questionnaire	18 months-3 years	Child Health care centres	None	Content analysis; Descriptive statistics
Regber; 2013; Sweden (300)	Child health centre nurses; n=15	Examine nurses' practice related behaviours to promote healthy weight gain and prevent obesity	Semi-structured interview	0-6 years	Children health centres	None	Thematic analysis
Redsell; 2013; UK (313)	Nurses; n=30 (20 HVs, 3 registered nurses (RN), 7 neonatal nurses)	Explore PCPs' beliefs and practices in relation to prevention of infant obesity	Semi-structured interview	0-2 years	Primary care trusts	None	Thematic analysis
Isma; 2013; Sweden (301)	Child Health centre nurses; n=18	Explore nurses' concepts of their preventive work with childhood overweight and obesity	Open-ended interviews	0-6 years	Primary care child health services	None	Thematic analysis
Findholt; 2013; USA (337)	Family medicine physicians (FMPs); PEDs; PAs; NPs; n=13	Explore providers' perceived barriers, resources, and training needs in relation to implementing recommendations for prevention of childhood obesity	In-depth interview	0-18 years	Primary care facilities in relatively remote rural counties	None	Thematic analysis
Bohman; 2013; Sweden (342)	Child health nurses (focus on health promotion and prevention); n=23	Investigate to what extent conversations between nurses and parents focus on child dietary and physical activity behaviours	Recording of conversation between nurse and parent at a well-child visit	2.5 - 4 years	Primary care child health services	Social cognitive theory(299)	Content analyses of recordings

Study author; Year, Country	Participants characteristics; sample size	Study aim	Study design and data collection methods	Service-user group	Primary care setting/context	Theory/model referred to	Analysis methods
Dera-de bie; 2012; Netherlands (305)	Child health practitioners; n=12 (6 physicians and 6 nurses)	Explore perceptions of HCP on prevention of overweight in infants in routine practice	In-depth Interviews	0-1 year	Child healthcare services (local authorities) for 0-4-year-olds;	'Model of determinants of innovation processes'(296)	Qualitative content analysis
Isma; 2012; Sweden (322)	Child Health nurses; n=18	Explore nurses' perspectives of childhood overweight and obesity	Open-ended Interviews	0-6 years	Primary care child health services	None	Thematic analysis
Rausch; 2011; USA (306)	PEDs and FPs; n= 96 (PEDs, 81%; FPs, 14.6%)	Explored attitudes and practices of obesity screening, prevention, and treatment	Survey questionnaire; included open-ended questions	2-18 years	Community based, hospital-affiliated practices		Descriptive statistics; various statistical tests
Wethington; 2011; USA (318)	GPs and PEDs; n= 871 (250 PEDs and 621 GPs);	Determine the proportion of PEDs and GPs who follow recommendations	Secondary analyses of data collected from a large survey study	2- 19 years	PCPs with paediatric patients	None	Descriptive statistics; various statistical tests
Huang; 2011; USA (307)	Family practice physicians & PEDs; n= 811	Explore assessment, counselling and management of diet, physical activity, and weight status	Survey questionnaire	0-2 & 2-17 years	Study was part a national survey study	None	Descriptive statistics; various statistical tests
Brown; 2011; UK (65)	HVs; midwives; BF counsellors; n=20 (midwives 4, HVs 4, BF counsellors 4, others 8)	Compare practitioners' and mothers' perceptions of factors that influence infant milk feeding decisions	Semi-structured Interviews	Mothers of infants	Community health care settings	Theory of planned behaviour(298)	Content analysis
Redsell; 2011; UK (England) (308)	GPs, practice nurses, HVs; survey, n=118; interview, n=18	Explore knowledge of obesity related health risks; beliefs and current practices in relation to prevention of obesity in infants	Survey questionnaire; semi-structured interviews	0-1 year	NHS Primary care trusts	None	Descriptive statistics and statistical tests; thematic analysis
Spivack; 2010; USA (309)	PEDs and NPs; n=87 (80 PEDs and 7 NPs)	Evaluate knowledge, current practices, and perceived barriers to childhood obesity prevention at first year well child visit	Survey questionnaire	1 year well-child visit	First-year well-childcare visits in primary care practices	None	Descriptive statistics
Sesselberg; 2010; USA (302)	Family physicians (FPs); n=445	Examine attitudes and practices about prevention, screening and use of body mass index (BMI) percentiles	Survey questionnaire	0-18 years	Clinics run by family physicians	None	Descriptive statistics; various statistical tests
Klein; 2010; USA (303)	PEDs; n=677	Examine practitioners' implementation of guideline-based screening including use of BMI percentile	Survey questionnaire	0-18 years	Rural (15%), suburban (44%) and urban (41%) facilities	None	Descriptive statistics; various statistical tests

Study author; Year, Country	Participants characteristics; sample size	Study aim	Study design and data collection methods	Service- user group	Primary care setting/context	Theory/model referred to	Analysis methods
Edvardsson; 2009; Australia (314)	MCH nurses; n=10	Explore PCPs' experiences of communicating issues with parents about children's overweight	Open-ended interviews	0-5 years	Culturally diverse rural and urban areas	None	Content analysis
Johnson; 2008; USA (338)	Primary care providers (State funded); 40% of the PCPs were Mexican Americans; n=38	Examine PCPs' perceptions of the feeding practices & behaviours, and cultural variables thought to contribute to infant obesity in the Mexican American community	Focus groups	Infants	Mexican American communities in an urban area	None	Thematic analysis
Woolford; 2008; USA (304)	PEDs and family physicians; n= 267	Explore barriers and facilitators to using BMI for pre-schoolers	Survey questionnaire	0-5 years	Well childcare clinics	None	Descriptive statistics; various statistical tests
Wallace; 2007; UK (England) (331)	HVs & midwives (HVs, 33%; midwives, 37%; 27% were voluntary staff); n=549	Assess perceptions of competence and training needs, organisational barriers, and preferences with regard to breastfeeding support to mothers	Survey questionnaires	Care for breast-feeding mothers	National Learning Needs Assessment study	None	Descriptive statistics; various statistical tests
Wallace; 2006; UK (England) (330)	PEDs and GPs; n= 177 (GPs=57; PEDs=120)	Examine perceptions of competence, skills, knowledge of policies on breastfeeding; training needs; organisational barriers.	Survey questionnaire	Care for breast feeding mothers	National Learning Needs Assessment study	None	Descriptive statistics; various statistical tests
Serrano; 2006; USA (339)	Women, Infants and Children (WIC) centres staff (nurses, nutritionists, nutrition assistants); n= 64	Assess attitudes, perceptions, and practices of staff in providing nutrition education to address childhood overweight	Survey questionnaire (included open -ended questions)	0- 5 years	National Program for Women and 0-5-year-olds	None	Descriptive statistics; various statistical tests; content analysis of text data
Tappin; 2006; UK (Scotland) (326)	health visitors; n=146	Document individual HV roles: interventions, activities, and attitude towards breastfeeding.	Survey questionnaire; routinely collected practice data	Breast-feeding mothers	Health visiting	None	Descriptive statistics; various statistical tests
Larsen; 2006; USA (319)	Family NPs and Paediatric NPs; n=99	Describe NPs' childhood obesity prevention practices; examine barriers & facilitators; compare practice across setting and specialty	Survey questionnaire (included open-ended questions)	0-5 years	Family practice and general paediatric practice settings	None	Descriptive statistics; various statistical tests; content analysis of text data
Tennant; 2006; UK (England) (333)	HVs and midwives; n=10	Explore the perceptions of their skills and attitudes to supporting breastfeeding mothers, to examine barriers and drivers for change	Focus groups	Breast-feeding mothers	Primary care trust in West Midlands, England	None	Thematic analysis

Study author; Year, Country	Participants characteristics; sample size	Study aim	Study design and data collection methods	Service-user group	Primary care setting/context	Theory/model referred to	Analysis methods
Smale; 2006; UK (332)	Primary care staff; n=73 (14 midwives, 19 HVs, 4 GPs, 3 PEDs and 2 PED nurses)	Explore views and perspectives of NHS staff, with the aim to conduct a learning needs analysis to plan for support for breastfeeding	Individual and group interviews	Breast-feeding mothers	Primary care; mixed social and ethnic profile	None	Thematic analysis
Perrin; 2004; USA (311)	PEDS; n=356	Determine PEDs' use of BMI; influence of BMI versus height and weight chart data on PEDs' concerns about overweight	Survey questionnaire (included using two different case vignette versions)	Including 0-5-year-olds	Primary care in a wide variety of practice settings	None	Descriptive statistics; various statistical tests
Rattay; 2004; USA (340)	PEDs who saw ≥ ten 2-18-year-olds/week; n=813	Explore practice related to counselling children about healthy weight/weight related topics	Survey questionnaire	2-18 years	Paediatric primary care practices	None	Descriptive statistics; Statistical tests (various)
Hellings; 2004; USA (327)	Paediatric nurse practitioners (PNP); n=77	Examine PNPs' knowledge, attitudes of breastfeeding and management of breastfeeding problems; comparison among nursing specialties and with paediatricians	Survey data (secondary analyses of data collected from an earlier larger study)	Support to breast-feeding mothers	Primary care services	None	Analyses methods not described
Gentile; 2004; USA; (343)	PEDs; n=365	Assess awareness of, agreement with, and implementation of recommendations to limit children's TV viewing/media time	Survey questionnaire	0-2 years	Well child visits in primary care	None	Descriptive statistics; various statistical tests
Gilbert; 2004; USA (320)	PEDS; n=24	Explore PEDs' attitudes to their role in providing anticipatory guidance for childhood obesity prevention	Open-ended Interviews	0-17 years	Primary care	None	Thematic analysis using the "editing analysis" style
Chamberlin; 2002; USA (315)	WIC Health care professionals (7 clinical nutritionists; 12 nurses); n=19	Examine perceptions of staff about challenges with preventing and managing childhood obesity	Focus groups and individual interviews	Mothers and pre-school children	State funded program for mothers and 0-5-year-olds.	None	Thematic analysis

Abbreviations: BF= Breastfeeding; FP= Family physicians; FNP = Family nurse practitioner; GP= General practitioner; HCP= Health care professional; HV=Health Visitor; L.A. = Local authority; NP= Nurse practitioner; PED= Paediatrician; PCP= primary care provider; PHN= Public health nurse; PNP= Paediatric NP; WIC= Women, infants, and children

Appendix H – Critical Appraisal Results of the studies

The quality of each paper was assessed using specific critical appraisal tools for quantitative (survey studies) and for qualitative studies. For mixed methods studies, the qualitative and quantitative data were separated and critically appraised using these design specific tools. The column (left most) showing the study information is colour coded to highlight the different study designs: cross-sectional surveys ; qualitative ; mixed-methods

(Abbreviations: Y=Yes; N=No; U=unclear or unknown; NA= not applicable). The studies are listed in order of their year of publication.

Table 1. Critical appraisal of survey studies and quantitative component of mixed methods studies

Study Author and Year	Appropriate sampling frame	Appropriate sampling strategy	Sample size calculation	Setting & participants information	Were valid methods used?	Outcomes measured reliably?	Questionnaire piloted?	Information	Response rate	Potential biases discussed?	Appropriate analysis	Score (total Y responses)	Reviewer's comments: the number of 'Yes' responses assigned to a study determined its appraisal 'score'; items marked NA were not included in computing the overall score; studies with a score between 5 and 7 (out of 10) were arbitrarily assessed as methodologically satisfactory, and those with above 7 (out of 10) as methodologically good
Cheng; 2020; (310)	Y	Y	N	Y	N	N	NA	Y	Y	Y	Y	6/9	Restricted sampling frame but included all eligible participants; response rate 58%; survey instrument not validated (was used by research team in a previous study); Concerns: possible self-selection and self-reporting bias
Belay; 2019; (312)	Y	Y	N	Y	U	U	NA	Y	Y	Y	Y	6/9	Sampling frame appropriate for study objectives; randomly selected nationally representative sample; response rate across the 3 surveys ranged from 53% to 63%; first mailed survey included \$2 payment as token of appreciation; Concerns: self-reported data; potential social desirability and recall bias
Tanda; 2017; (316)	Y	Y	N	Y	N	N	Y	Y	Y	Y	Y	7	Sampling frame appropriate for study objectives; random sampling; Concerns: small sample size; (response rate only 19.5%); possible non-response bias, self-selection bias and self-reporting bias
Dera-de Bie; 2016; (321)	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	8	Sampling frame appropriate for study objectives; non-probabilistic sampling (but everyone was invited to participate); high response rate; analyses informed by theory; Concerns: possible self-selection and self-reporting bias; no information about ethics approval
Laws; 2015; (280)	N	Y	N	Y	N	N	Y	Y	Y	Y	Y	6	Sampling frame appropriate for study objectives; Convenience sample; participation in survey carried possibility of financial reward; theory informed survey instrument pilot tested for face validity; Concerns: Possible self-selection and self-reporting bias
Nelson; 2015; (334)	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	8	Sampling frame appropriate for study objectives; non-probabilistic sampling (but everyone was invited to participate); high response rate (98.6%); Concerns: possible self-selection and self-reporting bias

Study Author and Year	Appropriate sampling frame	Appropriate sampling strategy	Sample size calculation	Setting & participants information	Were valid methods used?	Outcomes measured reliably?	Questionnaire piloted?	Response rate information	Potential biases discussed?	Appropriate analysis	Score (total Y responses)	Reviewer's comments: the number of 'Yes' responses assigned to a study determined its appraisal 'score'; items marked NA were not included in computing the overall score; studies with a score between 5 and 7 (out of 10) were arbitrarily assessed as methodologically satisfactory, and those with above 7 (out of 10) as methodologically good
Chelvakumar; 2014 (317)	Y	Y	N	Y	Y	N	N	Y	Y	Y	7	Sampling frame appropriate for study objectives; non-probabilistic sampling but everyone was invited to participate; Concerns: small sample size; no information on non-responders; possible non-response bias and self-selection bias
Pound; 2014; (329)	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	9	Randomly selected nationally representative sample; low response rate (but target number for participants was almost met); Concerns: possible self-selection bias and self-reporting bias
Bonnet; 2014; (335)	Y	Y	N	Y	Y	Y	N	Y	Y	Y	8	Sampling frame appropriate for study objectives; Non-probabilistic sampling but everyone was invited to participate; Concerns: data collection methodology may have contributed to overestimation of PCPs' practice implementation patterns (e.g., a single PCP may have indicated that they discussed fast food at both the four- and six-month visits; this study would count both of these as unique interventions being done by different PCPs); possible self-selection and self-reporting bias
Lowenstein 2013; (341)	N	Y	N	Y	Y	Y	Y	N	Y	Y	7	Sampling frame was restricted; non-probabilistic sampling (but everyone was invited to participate); Theory-informed study; Concerns: response rate not mentioned; possible self-selection and self-reporting bias
Robinson; 2013; (344)	Y	Y	N	Y	Y	U	N	Y	Y	Y	7	Sampling frame appropriate for study objectives; non-probabilistic sampling (but everyone was invited to participate); survey sample size was only 59; questionnaire was not piloted; however, it was adapted from a previous validated tool; Concerns: low response rate (22%); possible non-response bias, self-selection bias, and self-reporting bias
Ljungkrona-Falk; 2013; (323)	Y	Y	N	Y	U	U	N	Y	Y	Y	6	Non-probabilistic sampling (but everyone was invited to participate); high response rate (82%); Concerns: possible self-selection and self-reporting bias
Rausch; 2011; (306)	Y	Y	N	Y	U	U	N	Y	Y	Y	6	Restricted sampling frame; non-probabilistic sampling (but everyone was invited to participate); Theory informed study; non-random sampling; modest sample size (n=96); high overall response rate (82%) but lower for family medicine providers (52%); Concerns: possible self-selection and self-reporting bias

Study Author and Year	Appropriate sampling frame	Appropriate sampling strategy	Sample size calculation	Setting & participants information	Were valid methods used?	Outcomes measured reliably?	Questionnaire piloted?	Response rate information	Potential biases discussed?	Appropriate analysis	Score (total Y responses)	Reviewer's comments: the number of 'Yes' responses assigned to a study determined its appraisal 'score'; items marked NA were not included in computing the overall score; studies with a score between 5 and 7 (out of 10) were arbitrarily assessed as methodologically satisfactory, and those with above 7 (out of 10) as methodologically good
Wethington 2011; (318)	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	9/9	Secondary data analysis of a larger survey; Concerns: possible volunteer self-selection bias in original study; possible sampling bias in sample selected for this study; possible reporting issues (respondents might not have known if support staff were also counselling); too many variables were examined for data analysis (this increases the possibility of type 1 error); low response rate (20%); possible non-response bias and self-reporting bias
Redsell; 2011; (308)	Y	Y	N	Y	Y	Y	N	Y	Y	Y	8	Convenience sampling (but everyone was invited to take part); participants were experienced practitioners (most had been in practice for >10 years or longer; overall response rate could not be determined; response rate to postal survey was 34%; Concerns: possible non-response bias and self-selection bias
Huang; 2011; (307)	Y	Y	Y	Y	U	U	N	Y	Y	Y	7	Randomly selected and nationally representative sample; response rate >60%; Concerns: possible self-selection bias and self-reporting bias
Spivack; 2010; (309)	Y	Y	N	Y	U	U	N	Y	Y	Y	6	Limited sampling frame; non-probabilistic sampling (but everyone was invited to participate); Concerns: possible self-selection and self-reporting bias
Sesselberg; 2010; (302)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	9	Random sample from national registry; response rate ~40% (but only 60% of those were found to be eligible to take part); limited potential for generalisability of findings; Concerns: timeliness of the data: data was collected 3 years before study publication; possible self-selection and self-reporting bias
Klein; 2010; (303)	Y	Y	N	Y	U	U	N	Y	Y	Y	6	Random sample from national registry; response rate 67% (eligible and completed); Concerns: possible self-selection and self-reporting bias
Woolford; 2008; (304)	Y	Y	N	Y	U	U	N	Y	Y	Y	6	Appropriate sampling frame (for the study's aims); random sampling; response rate 52%; Concerns: possible non-response bias, self-selection bias and self-reporting bias
Wallace; 2007; (331)	Y	Y	N	Y	U	U	N	U	Y	Y	5	Appropriate sampling frame; non-probabilistic sampling (but everyone was invited to participate); response rate could not be determined but was estimated to be low (modest sample size); sampling bias; Concerns: possible self-selection bias and self-reporting bias

Study Author and Year	Appropriate sampling frame	Appropriate sampling strategy	Sample size calculation	Setting & participants information	Were valid methods used?	Outcomes measured reliably?	Questionnaire piloted?	Response rate information	Potential biases discussed?	Appropriate analysis	Score (total Y responses)	Reviewer's comments: the number of 'Yes' responses assigned to a study determined its appraisal 'score'; items marked NA were not included in computing the overall score; studies with a score between 5 and 7 (out of 10) were arbitrarily assessed as methodologically satisfactory, and those with above 7 (out of 10) as methodologically good
Wallace; 2006; (330)	Y	Y	N	Y	U	U	N	Y	Y	Y	6	Appropriate sampling frame; non-probabilistic sampling (but everyone was invited to participate); low response rate (between 4 and 29%); Concerns: possible non-response bias, self-selection bias and self-reporting bias
Serrano; 2006; (339)	Y	N	N	Y	U	Y	N	Y	Y	Y	6	Appropriate sampling frame; convenience sampling strategy limited the opportunity for eligible members to participate; questionnaire items were limited; high response rate; Concerns: possible self-selection and self-reporting bias
Tappin; 2006; (326)	Y	Y	N	Y	Y	Y	Y	Y	N	Y	8	Appropriate sampling frame; non-probabilistic sampling (but everyone was invited to participate); Concerns: Timelines - Study used chart data collected between late 1988 and early 1989; survey was conducted in 2000 and study published in 2006; possible self-selection bias and self-reporting bias
Larsen; 2006; (319)	Y	Y	N	Y	N	N	Y	Y	Y	Y	7	Sampling frame appropriate for study's aims; convenience sampling (but everyone eligible was invited to participate); response rate 34%; limited piloting; Concerns: Likert scale options not operationally defined (participants may have interpret the choices differently); possible self-selection and self-reporting bias
Perrin; 2004; (311)	N	Y	N	Y	Y	Y	N	Y	Y	Y	7	Convenience sampling (but everyone eligible was invited to participate; survey was limited in its scope (very brief survey); Concerns: Sampling frame restricted; Possible self-selection bias and self-reporting bias
Rattay; 2004; (340)	Y	Y	Y	Y	N	N	Y	Y	Y	Y	8	Large sampling frame; random sampling strategy; limited piloting; Concerns: response rate ~50%; non-response bias and self-reporting bias; timeliness of data: data was collected between 1998-1999
Hellings; 2004; (327)	Y	Y	Y	Y	U	U	NA	Y	N	U	5/9	Secondary analyses of data from a large survey study; original study's sampling frame was limited to one USA state; sampling strategy was non-probabilistic (but included all eligible participants); Concerns: method(s) of secondary data analyses not explained; possible self-selection and self-reporting bias
Gentile; 2004; (343)	Y	Y	Y	Y	U	U	N	N	Y	Y	6	Large sampling frame but limited to one state in the USA; random sampling strategy; Concerns: response rate was 41%; possible non-response bias and self-reporting bias

Table 2. Critical appraisal of qualitative studies and qualitative component of mixed methods studies

Study author; Year	Philosophy congruent	Objective congruent	Data collection congruent	Data analyses congruent	Interpretation of results	Theory or cultural stance	Researcher reflexivity	Participant representation	Ethical considerations	Conclusions of the research	Score (number of Y responses)	Reviewer's comments: the number of 'Yes' responses assigned to a study determined its appraisal 'score'; items marked NA were not included in the overall scoring computation; studies with a score between 6 and 7 (out of 10) were arbitrarily considered as methodologically satisfactory and those with above 7 (out of 10) as methodologically good
Cheng; 2020; (310)	U	Y	Y	Y	Y	N	U	Y	Y	Y	7	Mixed-methods study; interview questions aimed to elaborate on survey responses; all interviews were conducted by telephone; independent coding by two researchers; findings were discussed and checked with research team; concerns: no information on researcher reflexivity; study was limited in scope (only covered two local health districts); possible self-selection bias and self-reporting bias
Andersen; 2020; (188)	U	Y	Y	Y	Y	N	U	Y	Y	Y	7	Purposive and snow-balling sampling were used for recruitment; Concerns: no information about researcher reflexivity; possible self-selection bias
Kracht; 2019; (325)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7	Purposive sampling; one of the five interviewers and half of study participants identified themselves as American Indians (study investigated care for young AI children); Concerns: there is lack of information on the influence (if any) of ethnic and cultural background of the patient group on practitioners' practice behaviours
Moir; 2019; (324)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7	Participation was incentivised with financial reward; range of providers and regions (with diverse cultural and socioeconomic profiles) were included in the study but no representation from rural areas; Nominal group technique was used for priority ranking of ideas by participants; Concerns: no information about influence of researcher on the research; authors contend that data saturation would require more demographically diverse regions; time gap between first and last focus groups was 10 months – this may have changed the nature of the data that emerged, because tools for weight assessment had changed over that period
Nordstrand; 2016; (345)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10	Interviewer's professional role was same as the participants (this was considered as a strength by the study authors); sample size was 18 (aim was 20) but data saturation was reportedly reached; participants represented all parts of the country; Concerns: Nurses who took part in the study had special interest in the topic, which may have affected dependability of study findings; first author is also a PHN; the research team 'worked' to control potential bias, through discussions
Ditlevsen; 2016; (346)	Y	Y	Y	Y	Y	Y	N	Y	U	Y	8	GPs were reimbursed for their time spent; nurses were interviewed during their routine work hours; study underpinned by theory; Concerns: No information about who conducted the interviews and about ethical approval; participants (GPs and nurses) who took part were most engaged in the topic (selection bias was likely); study paper did not discuss 'strength and limitations' of the study

Study author; Year	Philosophy congruent	Objective congruent	Data collection congruent	Data analyses congruent	Interpretation of results	Theory or cultural stance	Researcher reflexivity	Participant representation	Ethical considerations	Conclusions of the research	Score (number of Y responses)	Reviewer's comments: the number of 'Yes' responses assigned to a study determined its appraisal 'score'; items marked NA were not included in the overall scoring computation; studies with a score between 6 and 7 (out of 10) were arbitrarily considered as methodologically satisfactory and those with above 7 (out of 10) as methodologically good
Bourgeois; 2016; (336)	U	Y	Y	Y	Y	N	Y	Y	Y	Y	8	All except one focus group were conducted in person; most healthcare professionals were from primary care clinics attached to academic centres (sample did not reflect the diversity of practices of the country); very limited representation from rural areas; Concerns: interviewer was known to some of the participants – no information about researcher's influence on the research
McLelland; 2015; (328)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7	Trained researchers led the focus groups; some participants (maternal child health nurses and domiciliary midwives) also worked as lactation consultants; demographic data of nurses was not collected; Concerns: sample selection focused on one region within the state where the study was held; according to the author, the findings may not reflect breast-feeding care in other regions
Laws; 2015; (280)	U	Y	Y	Y	Y	Y	N	Y	Y	Y	8	Interview questions explored survey responses; purposive sampling; sites (there were two) were selected on the basis of their willingness to participate in a feasibility study (planned for later) of an intervention; No information about interviewers' influence (if any) on participants; Grounded theory approach was used to analyse study findings; Concern: possible self-selection bias
Regber; 2013; (300)	U	Y	Y	Y	Y	N	Y	Y	Y	Y	8	Interviews were conducted in Swedish; quotations included in the paper were translated into English; no information if data saturation was reached; Concerns: no information about interviewers' influence on participants; possible self-selection bias
Redsell; 2013; (313)	U	Y	Y	Y	Y	N	Y	Y	Y	Y	8	Participants (HVs) were aware that the researcher was a practising HV; they may have felt the researcher was more knowledgeable than they were about the subject; Concerns: possible self-selection bias (HVs and nurses with an interest in the subject may have volunteered for the study); HVs' views may have been influenced by media attention at that time on the topic of introduction of complementary foods for infant
Robinson; 2013; (344)	U	Y	Y	Y	Y	Y	N	Y	Y	Y	8	Theory-informed analyses; interviews followed survey interview sample size small (n=10); interviews lasted ~20 minutes each; data saturation was considered to be reached; Concerns: no information about interviewers' influence (if any) on the participants; possible self-selection bias
Ljungkrona-Falk; 2013; (323)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7	Findings of focus groups data (the first phase of the study) informed the survey questionnaire (the 2 nd phase); Concerns: no information on researcher reflexivity; possible self-selection bias

Study author; Year	Philosophy congruent	Objective congruent	Data collection congruent	Data analyses congruent	Interpretation of results	Theory or cultural stance	Researcher reflexivity	Participant representation	Ethical considerations	Conclusions of the research	Score (number of Y responses)	Reviewer's comments: the number of 'Yes' responses assigned to a study determined its appraisal 'score'; items marked NA were not included in the overall scoring computation; studies with a score between 6 and 7 (out of 10) were arbitrarily considered as methodologically satisfactory and those with above 7 (out of 10) as methodologically good
Isma; 2013; (301)	Y	Y	Y	Y	Y	N	N	Y	Y	Y	8	All but one participant were female but the gender ratio represented the gender profile of staff in the region; quotes were presented to participants to check for credibility; Concerns: no information about researcher reflexivity; possible self-selection bias
Findholt; 2013; (337)	U	Y	Y	Y	Y	Y	N	Y	Y	Y	8	Theory informed study; recruitment was incentivised by financial reward; small sample size (n=13); Concerns: no information about data saturation; no information about interviewer's influence on participants; possible self-selection bias
Bohman; 2013; (342)	U	Y	Y	N	N	Y	NA	NA	Y	Y	5/8	Theory informed study; modest sample size (n=23) but participants represented 15 different primary care centres; given the variations in the findings across different participants (nurses), study authors believe a larger sample size may have produced more representative findings; study used descriptive statistics methods to analyse audio recordings; Concerns: only one session (randomly selected) was recorded per participant (therefore, session-specific data)
Dera-debie; 2012; (305)	U	Y	Y	Y	Y	Y	N	Y	N	Y	7	Theory informed study; only 12 participants; researchers concluded that data saturation was reached; Concerns: no information about interviewer's influence on participants; possible self-selection bias
Isma; 2012; (322)	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	9	Interviewer's professional background was same as the participants (this was believed to have facilitated data collection, according to the author); Concern: possibility of self-selection bias
Redsell; 2011; (308)	U	Y	Y	Y	Y	N	Y	Y	Y	Y	8	Mixed methods; Concerns: interviewers were known to both participant groups – this may have affected interview content; timeliness of the data (data was collected in 2008-09, study published December 2011); possible self-selection bias
Brown; 2011; (65)	U	Y	Y	Y	Y	Y	N	Y	Y	Y	8	Theory informed study; data saturation was reached; Concerns: no information about interviewer(s) (e.g., professional background) and their possible influence on participants; possible self-selection bias
Edvardsson; 2009; (314)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7	Authors concluded data saturation was reached (sample size 10); interviews lasted only between 11 and 33 minutes (not much probing was required to elicit views); Concerns: no information about interviewer(s) (e.g., professional background) and their possible influence on the research; possible self-selection bias

Study author; Year	Philosophy congruent	Objective congruent	Data collection congruent	Data analyses congruent	Interpretation of results	Theory or cultural stance	Researcher reflexivity	Participant representation	Ethical considerations	Conclusions of the research	Score (number of Y responses)	Reviewer's comments: the number of 'Yes' responses assigned to a study determined its appraisal 'score'; items marked NA were not included in the overall scoring computation; studies with a score between 6 and 7 (out of 10) were arbitrarily considered as methodologically satisfactory and those with above 7 (out of 10) as methodologically good
Johnson; 2008; (338)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7	Participants represented diverse practitioner groups (e.g., nurses, paediatricians, physician assistants, dietitians); the bicultural providers, 40% of whom self-identified as Mexican American and reported moderate acculturation levels, spoke both as healthcare providers and from their experiences as Mexican Americans and parents; Concerns: No information about researcher(s) (e.g., professional background) who facilitated the focus groups and their possible influence on participants, and the research; possible self-selection bias
Tennant; 2006; (333)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7	Sample size was only 10 participants; Concerns: a larger sample might have yielded richer data, according to study authors; no information about interviewer(s) (e.g., professional background) and their possible influence on participants; possible self-selection bias
Smale; 2006; (332)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7	Interviews were not recorded; typed reports of the handwritten notes of the interviews were checked with respondents for verification and amendments; Concerns: no information about interviewer(s) (e.g., professional background) and their possible influence on participants; possible self-selection bias
Gilbert; 2004; (320)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7	The interview guide was informed by obesity prevention recommendations of the American Academy of Paediatrics; authors did not discuss study strength and limitations; Concerns: no information about interviewer(s) (e.g., professional background) and their possible influence on participants; possible self-selection bias
Chamberlin, 2002; (315)	N	Y	Y	Y	Y	N	N	Y	Y	Y	7	Focus groups moderated by trained facilitator from the research team; subsequently, 1-2-1 interviews were conducted with purposively selected participants from the focus groups; concern: self-selection bias

Appendix I – Overview of the barriers and facilitators with supporting illustrative quotes

Table 1. Perceived barriers to implementation of guideline recommended practices.

[Abbreviations: HV= Health Visitor; PCP=primary care practitioner; BMI=body mass index; BF=breastfeeding; CHC= Child health centre]

Themes	Subthemes	Illustrative quotes	Sources
Individual PCP level	Lack of knowledge	<i>"If I was more clued up on what information to give I would feel happy to do that so it would boil down to education I think"</i> (Nurse) (308)	(280, 301, 303, 306, 308, 309, 313, 316, 321),
	Lack of skills	<i>"That (counselling about increasing physical activity and decreasing sedentary activity] doesn't seem as overwhelming to me as counseling about diet does."</i> (Physician) (337)	(280, 301, 305, 313, 321, 323, 337, 344)
	Lack of confidence	<i>"There are certain times you'd want to open the door [discussing food and weight] and sometimes you don't open the door because you don't know what lies behind that."</i> (Nurse) (338)	278, 306, 311, 312, 315, 319-321, 332, 336, 337, 342
	Lack of familiarity with guideline content	<i>"...I know what [the dietary] recommendations are, but only on a broad basis and not on a well...show me your dietary diary and let's see if ..." I'm not going to presume to be a dietician... I don't have that training"</i> (Physician) (337)	(301, 302, 309, 313, 321, 337, 343, 344)
	Disagreement with guideline content/ evidence	<p><i>"...we do see a lot of kids from four to five months starting to show that great interest in food and wanting to eat...So we have to sort of treat every child as an individual...So we can't say six months 100 % for every child"</i> (Nurse) (280)</p> <p><i>"when you calculate the child's BMI, it shows that the child is borderline overweight...and then I must talk about it. It's very hard because it feels like a big conflict".</i> (CHC Nurse) (323)</p> <p><i>"If there were evidence-based guidelines for that child with excessive weight gain then this would be helpful so you could actually say 'research shows our guidelines are' that would be really helpful."</i> (PCP) (188)</p> <p><i>'It's not easy to know what is true or not...one day you should eat less fat and the next day you read that people who drink full-fat milk maintain a healthy weight better. What advice should you give?'</i> (Child Health Centre Nurse) (323)</p> <p><i>"I have no problems at identifying obese sort of toddler, bigger than that, but really with babies I would feel quite concerned about saying that a child was obese as a baby"</i> (HV) (313)</p> <p><i>"I think we see that child on such a limited basis, I would be reluctant to discourage the parent from feeding a baby...or to cut back on feeding...And, so I would worry that whatever I say might adversely affect the feeding"</i> (nurse/ nutrition expert) (315)</p> <p><i>"I am not the kind of person who closely follows protocols. I try to tailor my advices to what fits into the parent's lifestyle"</i> (Physician) (305)</p>	(188, 280, 305, 308, 313, 315, 317, 320, 322, 323, 338, 343, 345, 346), (280, 305, 308, 309, 313, 317, 321, 322, 335, 338, 340), 299 (188, 280, 305, 308, 313, 315, 317, 320, 322, 323, 338, 343, 345, 346)

Themes	Subthemes	Illustrative quotes	Sources
Individual PCP level	Beliefs about outcomes	<p><i>"...We're only seeing them for fifteen minutes. How much can we really get accomplished? And there's a lot do to prevent obesity."</i> (Clinician) (336)</p> <p><i>"I don't know whether we're making any great changes or having any great influence on their decisions... Probably because the amount of time that we get to spend with people."</i> (Nurse) (310)</p> <p><i>"I think that physicians are always hesitant to bring up a problem if they don't have the answer for it."</i> (PCP) (188)</p>	(188, 280, 302, 303, 306, 310, 321, 334-336, 339, 343-346)
	Beliefs about role and responsibility	<p><i>"I personally would never [address childhood obesity]. I would have them talk to their doctor about that. I would never say, 'because he is at this weight, your child is unhealthy.'" (Nurse) (338)</i></p> <p><i>"Who should deliver it, well the health visitor would either deliver it herself or she would know where parents could go to get the information"</i> (Physician) (308)</p>	(300, 308, 313, 320, 321, 329, 338, 344, 346)
	Normalisation of mild overweight	<i>"It is normal to be slightly overweight, really. We have changed our values somewhat. One doesn't react quite as quickly as before when children are chubby"</i> (Nurse) (300)	(300, 313, 322, 323, 335)
	Belief: risk of harm to relationship with family	<i>"Well, it has probably happened that, perhaps you have had to stop after you started, because some parents have firmly said 'no, this is not possible', and then you have to back out."</i> (Child Health Centre nurse, Sweden) (298)	(188, 280, 300, 305, 308, 313-316, 320, 322, 323, 334, 336-338)
Family/parent	Parental practices and beliefs	<i>"Over feeding... early weaning would count as overfeeding. Over feeding I would think was the most important factor."</i> (Physician) (308)	(280, 300, 305, 308, 309, 313, 315, 319, 322, 335, 337, 338)
	Fear of offending parents	<p><i>I have learned to be careful with what I say to the parents. It's difficult to know how to present concern. You don't want to offend the parent. Already from the start, weight is a bit sensitive for the parents"</i> (Nurse) (322)</p> <p><i>"Parents talk about worrying about the BMI affecting the child's self-esteem so parents don't want to discuss it"</i> (Nurse) (324)</p> <p><i>Parents react negatively to child's BMI if it is over the 91–98 percentile, especially if the child appears normal weight"</i> (Nurse) (324)</p> <p><i>"Parents getting offended (often they are overweight, too) ... parents start crying and get offended"</i> (Nurse) (316)</p>	(280, 300, 308, 310, 313-316, 320, 322, 324, 334, 336, 338, 339)
	Parental resistance/lack of concern/lack of motivation	<p><i>"However, when parents are strongly opinionated, sometimes consultation is not more than advice, because you can't force parents to follow your advice."</i> (Nurse) (305)</p> <p><i>"If they have got their barriers up or, you know, their ears are closed, and you are bashing your head against a brick wall quite often, just – you know they don't want to hear it. They don't want to know about it"</i> (Nurse) (314)</p>	(186(280, 300, 301, 304, 305, 309, 310, 313-317, 319, 321, 322, 325, 334-336, 338, 339, 343-345)

Themes	Subthemes	Illustrative quotes	Sources
Family/parent		<p><i>"If I could magically wave my wand or make [the parents] change or you know become aware, just to realize that it really does matter now, it matters early on the habits that become established"</i> (PCP) (325)</p> <p><i>"With my handouts, sometimes I'll see them stuffed in the trashcan or blowing across the parking lot. It's kind of disheartening at times"</i> (PCP) (325)</p> <p><i>"A family comes to me with particular needs. Me bringing up their child's weight may not be of interest to them at that point. They may have other things that they are really worried about."</i> (PCP) (188)</p>	
	Parental overweight and lifestyle	<i>"The largest risk is probably when obese parents do not consider overweight problematic. Many suppose that because of their own overweight, their children will also be overweight. These parents will not change their lifestyle."</i> (Nurse) (305)	(305, 309, 315, 316, 321, 323, 344, 504)
	Parents' knowledge and skills	<p><i>"I think an obese parent is certainly a factor, I think poor socio-economic groups tend to have less knowledge on diet, as well as less money too, they think that a healthy diet is more expensive. I do feel that a lot of young parents now haven't learnt how to cook, from basics"</i> (Nurse) (308)</p> <p><i>"...parents will say well they won't eat it, and so they don't understand that it can take like 10 or 15 times of offering the same thing before the child may accept it"</i> (PCP) (325)</p> <p><i>"[Parents] think that [infants] should just be all calm and settled all the time. ... So, looking at things like ... baby cues, and whether they're hungry, whether they're tired ... they tend to [think] 'Oh, I'll just feed them anyways'."</i> (Nurse) (310)</p>	(280, 300, 304, 305, 310, 313, 315, 316, 322, 325)
	Parents' mis-perception of healthy infant weight	<i>"Usually most of them associate a fat baby as a healthy baby, and they don't perceive the baby as gaining too much weight. Really, everyone is marvelling at that baby and saying 'Oh, what a big baby. Look at those legs, they're so big.' So they see that as something really good."</i> (Nurse/nutrition expert) (315)	(280, 310, 313-315, 338)
	Influence of peers/grandparents	<p><i>"You're not going to get them to leave their social support group...If there are four other women around saying, 'that's not how we do it...' Even if you really want to do [what the provider says], you're going to feel bad because they're there all the time."</i> (Practitioner) (338)</p> <p><i>We can teach, and teach our children but if at the end of the day it's the grandparents buying the food, so we want to include them on that"</i> (PCP) (325)</p>	(280, 308, 325, 338)
	Sociocultural norms influence perceptions	<i>"Well there are definitely in the Asian community it's definitely a sign of prosperity to have nice chubby children"</i> (HV) (313)	(280, 300, 310, 313-315, 322, 338, 339)

Themes	Subthemes	Illustrative quotes	Sources
Family/parent	Parents have other complex problems to deal with	<p><i>‘But you have a few families...where the problem with the child’s overweight is just one little problem together with all the other problems in the family...In this case it’s not so easy’</i> (Nurse) (323)</p> <p><i>“Overcrowded homes, no routines, children help themselves to food”</i> (Nurse) (324)</p> <p><i>“A family comes to me with particular needs. Me bringing up their child’s weight may not be of interest to them at that point. They may have other things that they are really worried about.”</i> (PCP) (188)</p>	(188, 313, 315, 323, 324)
	Parent/family Socioeconomic condition	<p><i>“...I think poor socio-economic groups tend to have less knowledge on diet, as well as less money too, they think that a healthy diet is more expensive. I do feel that a lot of young parents now haven’t learnt how to cook, from basics”</i> (Nurse) (308)</p> <p><i>“...the thing is that we live in a society where the cheapest foods available to us are the most calorie dense and so when you don’t have access to good healthy choices it’s tough and you have to make that extra effort”</i> (PCP) (325)</p>	(306, 308, 310, 313, 315, 316, 321-323, 325, 337, 344)
Organisational level	Time constraints	<i>“Another question is whether there is enough consultation time. There are a lot of topics to which attention has to be paid during the consultation with parents. Time is a restrictive factor...”</i> (Physician) (305)	(65, 188, 280, 301-305, 309, 310, 313, 315, 316, 321, 323, 334-337, 343-346)
	Lack of role support	<i>“Yes, we started, but then we realized...that with this amount of resources, is it possible to do a qualitatively good job? In our opinion it’s necessary to increase the budget, making it possible for us to offer the families the good nursing they deserve. The topic is quite demanding, affecting feelings and interaction in the families, and we figured - status quo, we cannot do it.”</i> (Nurse) (345)	(65, 280, 301, 305, 321, 323, 330, 331, 344-346)
	Lack of training	<i>“Like I mentioned I never had any training, but I’m giving advice, and I’m sure there’s lots of other people in the same position.”</i> (Physician) (308)	(280, 301, 302, 308, 310, 313, 321, 334, 337, 344)
	Lack of resources	<p><i>“There is a lot of information [resources] starting with weaning but there is not much to back that up moving onto family foods.”</i> (HV) (313)</p> <p><i>“I think the resources are very much lacking in, you know, information about their culture and what they eat, so we can address it from their point of view...”</i> (Nurse) (310)</p> <p><i>“If there were a tool more readily available for beyond just looking at percentages and the rate of growth on growth charts. If there were maybe not BMI but maybe rate of weight gain so you could say it would help keep on the radar.”</i> (PCP) (188)</p>	(188, 280, 301, 306, 310, 313, 321, 335, 336, 344)

Themes	Subthemes	Illustrative quotes	Sources
	Lack of united coherent approach	<p><i>"Sometimes... if you referred someone whose... over two centiles higher you tend to get from the paediatricians oh well why are you referring this child really, as a kind of I don't think this is too important and when the paediatricians are overloaded themselves with other problems that they think the message you know I think we get mixed messages about what is obese"</i> (HV) (313)</p> <p><i>"Actually, there is no cooperation with paediatricians and family doctors concerning the topic of overweight"</i> (Physician) (305)</p> <p><i>"They'll [parents] say the GP said so and so and some GPs will send them off to us and other GPs will send them to the Practice Nurse or you know may not be giving the same advice that we're giving and so certainly you need to involve everybody so that we're saying the same things"</i> (HV) (313)</p>	(300, 305, 313, 323, 324)
	Lack of support from other PCP groups	<i>"It is really difficult and unfortunate for us, because it would matter so much if the doctor did it. The doctor has a great power. And if the doctor said 'It's important that you'll get some lifestyle conversations with the health visitor', it would be SO much easier for us to get the message through to the family"</i> (HV) (346)	(301, 305, 308, 315, 346)
	Lack of opportunity for contact	<i>"... traditionally we see kids up to the two-year old because that's their last inoculation or ... eighteen months. So we don't actually see them.... until they go to school ... there's that gap in their care ... traditionally [in] family practice."</i> (Physician) (336)	(300, 310, 336, 337, 346)
	Lack of continuity of care	<i>"If you had someone whom you could see a couple of times in a row, then you could build up a rapport. Because with the first home visit you find that you are just building up that trust... 'I have had 5 different people tell me 5 different things and you're going to be another one.' I had one woman say that to me...and it is not always taken well "</i> (Nurse) (328)	(280, 328, 333, 337)
	Limited access to community programs/specialists	<i>"Yes, the dietician or physiotherapist...However, I don't know which programs they have for example to stimulate physical activity for the young child."</i> (Physician) (305)	(280, 301, 305, 313, 334, 335, 344, 346) (302)

Table 2. Perceived facilitators to implementation of guideline recommended practices.

Theme	Subtheme	Illustrative quote	Sources
Practitioner level	Knowledge and confidence	<p><i>"We didn't know if this was a good way to do it. We didn't know if this was the final way. We wanted to make sure there was room to improve, and we wanted everyone to focus on the quality assurance this would lead to."</i> (Nurse) (345)</p> <p><i>"I used to not think it was involved in eating or any of it, but the more I work with children, the more I see that. Their behavioural issues affect their health, their obesity, everything of their life"</i> (PCP) (325)</p> <p><i>"What they eat affects how they grow, how they learn, how they behave, how they sleep, how they act . . . makes such a huge difference"</i> (PCP) (325)</p>	(188, 301-303, 318, 319, 325, 330, 331, 337, 341, 343-345)
	Communication skills (to overcome barriers): ability to engage with family	<p><i>"Yes, first of all you want to do it in a respectful manner, because many of the parents feel they have failed when they see the percentile pointing in the wrong direction...But we've been thinking and reflecting a lot on which methods to use to motivate the parents, and also to explain.... I think these guidelines are so useful in that way..."</i> (Nurse) (345)</p> <p><i>"I like families to know that it is usually not their fault that's really the thing is that we live in a society where the cheapest foods available to us are the most calorie dense and so when you don't have access to good healthy choices it's tough and you have to make that extra effort"</i> (PCP) (325)</p>	(280, 300, 301, 309, 313-315, 325, 345)
	Ability to use practice prompts/tools to aid communication	<p><i>"But I feel that when you have the BMI chart, you have so much to benefit there, that you can show it, and we can truly say that now it has increased. No, you can look at it and talk about it, and talk a little about what you could change"</i> (Nurse) (300)</p> <p><i>"...Has gotten easier with experience/time, also nurses are better at recognising earlier if BMI is going to be an issue"</i> (Nurse) (324)</p>	(280, 300, 313-315, 324)
	Belief: positive feelings about role	<p><i>"I'd say we have a lot of contact with families certainly in the first six months around feeding and moving onto weaning and then early young children's diet forms quite a significant part of my role."</i> (Health Visitor) (313)</p> <p><i>"When my clients are here with their children, I always stress . . . this is not a diet; this is a family lifestyle that your children or your grandchildren should be included in"</i> (PCP) (325)</p>	(300, 302, 303, 309, 313, 320, 321, 325, 327, 333, 344, 345)
	Belief: positive feelings about role	<p><i>"I do not think that I have avoided it, because my task it is to ensure that the children feel as well as possible and get a good start in life...You know, a lot happens between the ages of 2 1/2 years and 6 years, and if I see something, then it's my responsibility."</i> (Nurse) (300)</p>	

Theme	Subtheme	Illustrative quote	Sources
Practitioner level	Positive relationship with family	<i>"And you have to work also on your relationship, how good relationship you have with the family depending upon the degree of how much you can come down on them about it..."</i> (Nurse) (314)	(314, 320, 328, 336)
Parent level	Receptive parents	<i>"They embrace what you talk about, changing the diet and trying to assimilate the tips and advice that I have given...The easiest ones are the parents who say 'help me'. They're definitely the easiest."</i> (Nurse) (300)	(280, 300, 314, 336, 345)
Organisation level	Perception of support for PCP's role	<i>"The DGP [Division of General Practice] came through and gave us support to set it HKC [Healthy Kids Check] up. We have a template from them...and also training at the Division so I'm fairly confident in what I'm doing"</i> (Nurse) (344) <i>"Training has helped confidence"</i> (Nurse) (324)	(303, 324, 334, 344, 345)
	United approach amongst different PCP groups	<i>"And what we're working hard on, everyone who works at the CHC, and those who work in the children's team, is that we try to talk the same language, that we do not say different things, because it gives a sense of insecurity"</i> (Nurse) (300)	(300, 315, 333, 345)
	Adequate resources (staffing)	<i>"If we had somebody who was able to sit down and spend a focused amount of time with the parent and the child in the [clinic] setting, it seems like it would be more effective than me trying to do everything at the time of the well child exam"</i> (PCP) (337)	(280, 302, 328, 337)
	Resource and training needs	<i>"I think assessing children's diets and the children's BMI...would actually be quite good (to have) a bit more background and knowledge about that as well... healthy eating recommendations for children... physical activity recommendations . . . and then perhaps some strategies to encourage families to adopt healthy lifestyles as well"</i> (Nurse) (344) <i>"BMI app better than a chart. Colour on (BMI) app a good indication for patients"</i> (Nurse) (325)	(302, 303, 319, 325, 333, 341, 343, 344)
	Professional autonomy/ empowerment of role	<i>"I think that we'd be more effective if we could just find out where the person is that day and not be required in the 10 minutes we have with them to go through all the information we are required to give them...And we could be more effective in our timing if we counselled more on where the person was, instead of what we were required to cover"</i> (Healthcare provider) (315)	(280, 315, 344)

Appendix J – Approvals for the intervention development research

1. Newcastle University Ethics Committee approval

Ethics Form Completed for Project: Development of an intervention to support health visitors' practice and implementation of guidelines to prevent early childhood obesity, in County Durham.

Policy & Information Team, Newcastle University <noreply@limesurvey.org>

Thu 13/12/2018 14:40

To:

Dave Ray (PGR) <D.Ray2@newcastle.ac.uk>

Ref: 9620/2018

Thank you for submitting the ethical approval form for the project 'Development of an intervention to support health visitors' practice and implementation of guidelines to prevent early childhood obesity, in County Durham.' (Lead Investigator: DEVASHISH RAY).

Expected to run from 01/02/2018 to 29/11/2019.

Based on your answers the University Ethics Committee grants its approval for your project to progress. Please be aware that if you make any significant changes to your project then you should complete this form again as further review may be required. If you have any queries, please contact res.policy@ncl.ac.uk

Best wishes

Policy & Information Team, Newcastle University Research Office

res.policy@ncl.ac.uk

2. Health Research Authority approval



Mr. DEVASHISH RAY
PhD student
Institute of Health and Society, Newcastle University
Baddiley Clarke building,
Richardson Road
Newcastle University, Newcastle upon Tyne
NE2 4AX

**Health Research
Authority**

Email: hra.approval@nhs.net
Research-permissions@wales.nhs.uk

12 February 2019

Dear Mr. RAY

**HRA and Health and Care
Research Wales (HCRW)
Approval Letter**

Study title:	Development of an intervention to support Health Visitors' practice and implementation of guidelines to prevent early childhood obesity, in County Durham.
IRAS project ID:	249796
Protocol number:	N/A
REC reference:	19/HRA/0920
Sponsor	Newcastle University

I am pleased to confirm that [HRA and Health and Care Research Wales \(HCRW\) Approval](#) has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

How should I continue to work with participating NHS organisations in England and Wales?
You should now provide a copy of this letter to all participating NHS organisations in England and Wales, as well as any documentation that has been updated as a result of the assessment.

Participating NHS organisations in England and Wales will not be required to formally confirm capacity and capability before you may commence research activity at site. As such, you may commence the research at each organisation 35 days following sponsor provision to the site of the local information pack, so long as:

- You have contacted participating NHS organisations (see below for details)
- The NHS organisation has not provided a reason as to why they cannot participate
- The NHS organisation has not requested additional time to confirm.

You may start the research prior to the above deadline if the site positively confirms that the research may proceed.

Page 1 of 7

3. NHS Research and Development approval

R0358_IRAS 249796_Hosting of study_An Intervention to support health visitors practice_HDFT approval

Pearson Jo (RCD) Clinical Research <jo.pearson@hdft.nhs.uk>

Fri 22/02/2019 12:31

To:

Dave Ray (PGR) <D.Ray2@newcastle.ac.uk>

Cc:

CLINICAL RESEARCH R&D UNIT <RESEARCH@hdft.nhs.uk>;

Beedle, Annie [RCD] <annie.beedle@hdft.nhs.uk>;

SmithAmanda [RCD] <Amanda.Smith@hdft.nhs.uk>;

Webster, Jane [RCD] <Jane.Webster@hdft.nhs.uk>;

Janice Fulford <jan.fulford@nhs.net>;

Deborah Lowry <deborah.lowry@nhs.net>

Dear Dave & R&D

Full Study Title: **An Intervention to support health visitors practice**

IRAS : **249796**

Please accept this email as confirmation that *Harrogate & District NHS Foundation Trust* is happy to host the above study.

If you encounter any difficulties or require some local assistance, please do not hesitate to contact me.

Good luck with your study and best wishes

James

Dr James Hughes,

Research and Development Manager, Harrogate and District NHS Foundation Trust (HDFT)

Innovation Champion, HDFT – Medipex/York and Humber Academic Health Sciences

Network (YHAHSN)

T: 01423 555697

Appendix K – Participant information sheet

Participant Information Sheet



IRAS Project ID: 249796

Project title: An intervention to support health visitors' practice, in County Durham.

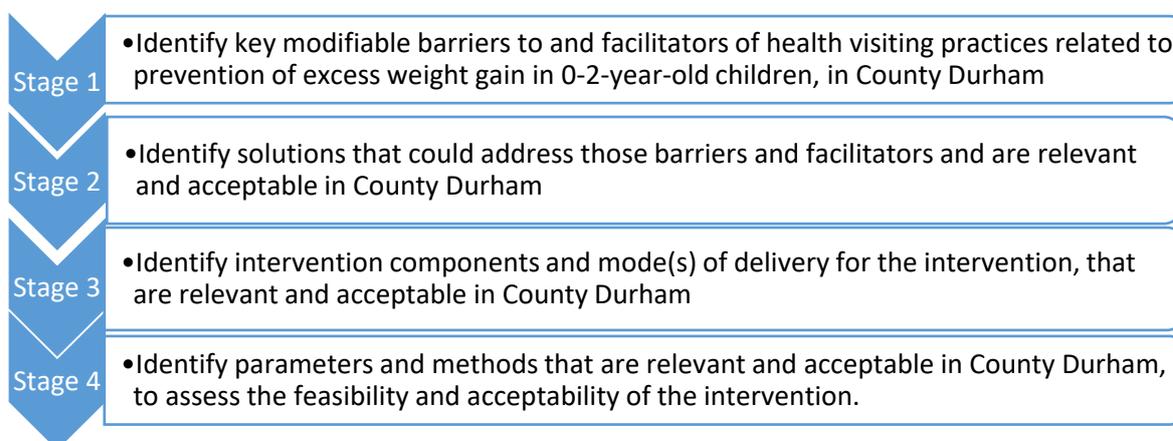
What is the purpose of the research?

Prevention of childhood obesity is an important public health issue for Durham County Council (DCC). The Council has commissioned the NHS Harrogate and District Foundation Trust (HDFT) health visiting staff to lead and coordinate the 0-5 Healthy Child programme in County Durham. Research supports that health visitors (HVs) are ideally placed to address childhood obesity prevention during the early years. Supporting HVs to implement guideline-recommended practices and integrating those approaches into routine service delivery is an important priority for the Public Health department of DCC. However, implementing guideline-recommended practices in real world settings can present numerous challenges. This research will engage with local professional stakeholders to develop an intervention that aims to support HVs' professional practice in prevention of excess weight gain in 0-2-year-old children. The stakeholder groups for this study are:

(a) The end-users of the intervention; they are the HVs and other frontline staff of the County Durham health visiting Team.

(b) The people who will have a role in delivery of the intervention in County Durham; they are members of the County Durham health visiting team who work in a supervisory/managerial role.

The development of the intervention will take place in four stages, by conducting interactive participatory workshops with different HV teams within County Durham. Each stage of the workshop will result in output(s) to inform the design of the intervention; these outputs will be used as inputs for the next stage of development. The aims for each stage of the workshops are shown in the flow diagram below:



Why have I been approached?

You are being invited to join the study because you are one of the professionals who is closely involved with prevention of childhood obesity in the early years, in County Durham. Your perspectives and experiences will inform the development of the intervention.

Do I have to take part?

Taking part is entirely voluntary. It is completely up to you to decide whether or not to take part. If you wish, you can discuss taking part with others and I can go through this information sheet with you and answer any questions you may have before you decide – you can contact me using the details below and on the invitation letter. If you agree to take part, I will ask you to complete and sign the study's consent form.

You are free to decline participation in the study or to withdraw at any time, without giving a reason and without detriment to yourself. There will be no negative implications if you decide not to take part or to withdraw from the study.

What does taking part involve?

If you decide you would like to take part, you will be asked to participate in one or more of the group workshops. The workshops will be planned in such a way that they immediately follow and take place in the same facility where health visiting teams hold routine staff meetings on a monthly basis. They will involve members of that health visiting team.

There will be four stages of workshops with each workshop lasting for 45 minutes to an hour. Two to three workshops will be held at each stage, to allow teams of HVs from across Durham to provide their views. Participation in more than one workshop is welcomed but not essential. The end of the stage 4 of the workshops will mark the end of the study for the participants. The workshops will be spread out over a period of 9-10 months, from February to October/November 2019.

Prior to each workshop, you will be provided with information about the topic that will be covered at that session. After the first workshop has been completed, a summary of the outputs of preceding workshops will also be provided.

At the workshops, your role would be to contribute to the development of the intervention by providing your perspectives, based upon your own professional and personal experiences. Your ideas will be gathered through discussion and group activities. The workshop sessions will be audio-recorded, with informed written consent from all the participants. Flip charts, post-it notes, and paper sheets may also be used to capture your views and perspectives.

At the end of each workshop, you will be invited to provide written feedback about your experience of taking part in the workshop; a feedback request form will be distributed to all participants for this purpose. You will have the option of providing feedback anonymously if you wish, either immediately after the workshop is over or, if you prefer, you can complete the form at your own convenience/in private and then send it back using a pre-paid envelope.

Will my taking part in the study be kept confidential?

All information that is provided by you during the course of this research will be kept strictly confidential and will be securely stored in a locked filing cabinet in a secure building at Newcastle University which has no access to the public. To make the data anonymous, any references to identifiers such as names and places on any text data and from the transcripts of the audio recordings will be removed or altered, prior to start of the analysis of the data. Publication of direct quotations from respondents is necessary to report the results of qualitative research, but all identifying information will be removed from such quotations. No information identifying anyone involved will be included in any reports or publications. In line with the Newcastle University research data management policy, anonymised transcribed data may be securely stored for a maximum period of ten years after the completion of the study.

What will happen to the results?

A report of the findings of the study will be shared with all stakeholder groups and the organisations that are jointly funding this research. If you would like to receive a copy of the report, please get in touch with me using the contact details provided below and on the invitation letter. The results of this research will be written down in a thesis that will be submitted to Newcastle University, as a requirement for the award of a PhD degree. It is anticipated that the results of this research will also be presented at relevant scientific conferences and submitted for publication in academic journals.

Are there any risks to taking part?

It is possible that you may feel reluctant or uncomfortable discussing and sharing your professional work experiences and experiences of interacting and working with others. It is completely up to you what and how much information you want to share. I will ask you to commit to the confidentiality of the group discussions and not to share what is said in the groups with others.

If you do experience any distress following participation you can discuss your concerns with me and/or my supervisor using the contact details provided below and on the invitation letter.

Are there any benefits to taking part?

We hope that you will find taking part in the workshops interesting. The workshops will provide an opportunity for you and your colleagues to take time out and reflect on different aspects of your practice and working and interactions with others. Furthermore, you will play a key role in the development of an intervention which is aimed to support you and your team in your professional practice and address the important issue of childhood obesity.

What will happen if I don't want to take part?

If at some point, you decide not to be involved any longer, please tell me directly. Your decision will be treated with respect and your decision will not affect you negatively in any way. If you withdraw from the study, the data already provided by you up to that point will

be included in the study. All data will be anonymised, and it will not be possible to identify your contribution.

Who is the sponsor and data controller for this research?

As the sponsor of this research, Newcastle University will act as the data controller for this research. This means that Newcastle University is responsible for looking after your information and using it properly. Individuals at Newcastle University may look at your research data to check the accuracy of the research study. Your rights to access, change or move your information are limited, as Newcastle University need to manage your information in specific ways in order for the research to be reliable and accurate. If you withdraw from the study, Newcastle University will keep the information about you that has already been obtained. This information will not identify you and will only be used for the purpose research and cannot be used to contact you.

You can find out more about how Newcastle University uses your information at <https://www.ncl.ac.uk/research/researchgovernance/ethics/gdpr/> and/or by contacting the University's Data Protection Officer (Maureen Wilkinson; Email: rec-man@ncl.ac.uk).

Who is funding this research?

This PhD project is a fully funded studentship jointly funded by Newcastle University, Durham County Council and Fuse, the centre for translational research in Public Health.

Has this study received Ethical approval?

This study will begin only after it has received all the necessary approvals and permissions. It will be reviewed by the Newcastle University Ethical Committee, the NHS Health Research Authority and Durham County Council Research governance framework.

I hope you will be interested in taking part. Thank you for taking the time to read this information leaflet and for considering taking part in this study.

If you would like further information about the research, please contact:

Contact information of researcher:

Dave Ray
Institute of Health and Society
Newcastle University
Email: d.ray2@newcastle.ac.uk
Tel. no. (Work): 0191-2088500

Contact information of academic supervisor:

Professor Falko Sniehotta
Institute of Health and Society
Newcastle University
Email: falko.sniehotta@newcastle.ac.uk
Tel. no. (Work): 0191-2083815

Appendix L – Workshop evaluation report

Introduction

Engaging with stakeholders to develop complex interventions have become increasingly common in healthcare settings and is recommended by research funding and governing bodies (479). Although intervention development studies frequently report involving stakeholders of the intervention, there is currently limited knowledge about the impact of stakeholder engagement on the research process and stakeholder's experiences of participation (376, 505). A key aspect of interactive workshops is the requirement for the researcher to provide a combination of techniques, activities and support that enables participants to better understand the information presented, explore context, and generate ideas. Health visitors (HVs) were active participants of the workshops that were held for the designing of the intervention, and they are also the target audience for it. Therefore, it was relevant to explore HVs' experiences of participation in the workshops and their views of the activities that were intended to promote creativity and participation.

Method

Data collection

An evaluation questionnaire was designed to collect participants' anonymous self-reported evaluation data using questions that are appropriate to evaluate creativity in co-design workshops. The seven-item questionnaire used a 5-point Likert scale rating ranging from strongly disagree to strongly agree (specimen shown below). Participants also had the opportunity to record any comments and opinions. An open question at the end of a questionnaire allowed HVs to elaborate on their responses to closed questions. The questionnaires were completed immediately after the workshop activities were completed.

Data analyses

The number of respondents who indicated their level of agreement on the 5-point Likert scale for each item were calculated. The descriptive data were presented as percentages. An interpretative approach was used for analysis of the responses to the open-ended question by using content analysis of the data. Responses that were sufficiently similar were grouped into a "key finding".

Workshop evaluation questionnaire.

Workshop Stage: Stage 1 Stage 2 **Stage 3** Stage 4

Today's Date: _____

Instructions:

Please circle your response to the items. Rate your experiences of taking part in the workshop on a 1 to 5 scale:

1= Strongly disagree; 2= Disagree; 3= Neither agree nor disagree; 4= Agree; 5= Strongly agree

Your feedback is sincerely appreciated. Thank you.

- | | | | | | |
|---|---|---|---|---|---|
| 1. It was easy for me to identify the objectives of the workshop. | 1 | 2 | 3 | 4 | 5 |
| 2. I was very engaged and enjoyed taking part in the workshop. | 1 | 2 | 3 | 4 | 5 |
| 3. I was prompted to generate ideas on a variety of issues. | 1 | 2 | 3 | 4 | 5 |
| 4. I was able to work together with others easily. | 1 | 2 | 3 | 4 | 5 |
| 5. I felt able to explore many different options, ideas, and outcomes. | 1 | 2 | 3 | 4 | 5 |
| 6. It was easy for me to gain an overview of the information and ideas that were presented. | 1 | 2 | 3 | 4 | 5 |
| 7. I was able to combine my existing knowledge with insights developed from the ideas presented at the workshop, to generate new ideas. | 1 | 2 | 3 | 4 | 5 |

Are there any other comments, ideas, or suggestions you would like to share with us?

.....

Results

A total of 121 completed responses were collected from 142 HVs who took part in the 11 workshops that covered the stages of the designing of the intervention, with a response rate 85%. The cumulative findings of the questionnaires from all the workshops are summarised in a table below. The survey findings show that overall, the majority of participants agreed that the information and materials presented at the workshops were easy to comprehend and the techniques and activities used at the workshops facilitated participation and generation of ideas.

Table showing the findings from the analysis of the feedback questionnaire

Item	Description of the item	Total number of responses (n=121)				
		Strongly disagree (%)	Disagree (%)	Neither agree nor disagree (%)	Agree (%)	Strongly agree (%)
1	It was easy for me to identify the objectives	0	2.4%	12%; (7% were from stage 1 workshops)	50%	35%
2	I was very engaged	0	0	2.0%	50%	48%
3	I was prompted to generate ideas	0	0	4.0%	36%	60%
4	I was able to work together with others easily	0	0	1.0 %	12%	87%
5	I felt able to explore different options and ideas	0	1.6%	2.4%	36%	60%
6	It was easy for me to gain an overview of the information and ideas that were presented	0	0	5.7%	50%	44%
7	I was able to combine my existing knowledge with insights developed from the ideas presented, to generate new ideas	0	0	9%; (5% were from stage 1 Workshops)	39%	52%

The survey data was supported by numerous positive observations about the way the workshop activities were organised to support open discussions, reflective thinking, and idea generation:

“The session was very well planned and identified themes well in current practice and strategies for future health visiting practice”

“Session was very good in promoting discussion about current practices in health visiting and how this can be improved for practitioners, families and local communities”

Analyses of the responses from the different workshops revealed that that the less favourable responses (which were small in number and related to items 1, 6 and 7 - identification of the objectives of specific activity, understanding of the presented information and perceived support for generation of new ideas) were largely related to one activity (contextual relevance locally of the facilitators and barriers identified in the systematic review) that was included in the first two stage 1 workshops. The need for more clarity was promptly addressed by me (as the researcher) and the co-facilitator by elaborating on the information provided in the workshop materials. In their feedback, participants expressed this was helpful:

“The objective of today was confusing initially but once it was clarified, I was able to participate and answer questions appropriately”

“I got a little confused and needed clarification...otherwise I enjoyed the workshop”

Some workshops immediately followed HVs’ monthly staff meetings. This was convenient for most HVs but may not have suited everyone, as illustrated by one comment:

“To have separate venue- not on back of previous meeting as we were a bit jaded”

Analysis of the open responses

There were 35 responses to the open-ended question. The analysis identified several key findings.

1. HVs valued the opportunity to take part in the research

“It was a good opportunity to share and discuss barriers/interventions to be tackling a pertinent public health issue. I hope the research has a positive impact and enables HVs to intervene and promote healthier weight and nutrition for our future generations”

“Really enjoyed taking part in the workshop. We often don’t get the opportunity to be involved in the development of training”

Some HVs noted that participation in the workshops had motivated them to reflect upon their current practices and consider how to manage their work:

“Encouraged to look at own practice with others”

“Enjoyable workshop, giving me ideas for my own managed practice”

2. Recognition of HVs professional role (and communicating it to them) was appreciated

“It is very encouraging to know what we do matters, and our views are being seriously considered”

“Good that other professionals are aware how important HVs are in the community and that we can work with families in the community”

3. HV’s role as collaborators in research that is relevant to their practice was appreciated

“It is really encouraging that a piece of research of this size takes on board the views and ideas of practitioners who are working with families every day”

“I am pleased that the views and experience of staff who are working on the ground are taken into consideration and valued”

4. HVs are interested to know the outcomes of this research

“Hope that information and ideas put forward will be acted on. More often than not the practitioners doing the job who give valuable information is not taken on board which can be very frustrating.”

“This is thought provoking, valuable work that we all need to prioritise to make a difference to the families we work with. Thank you for understanding this work. Look forward to next stage and outcome.”

5. HVs perceived the workshop facilitator’s “style” of conducting the workshop as helpful

“Well delivered and very friendly...kept audience engaged and momentum going for delivery”

“Very interactive workshop. Fun to participate”

Discussion

Participants’ evaluation of the workshops suggests that it proved possible to meaningfully engage with HVs to inform the intervention development research. The process of engaging with HVs appears to have worked well, and the interactions at the workshops produced the intended outputs. These findings and my own lessons and experiences (in the role of the workshop facilitator) might be useful in informing the delivery of the training intervention. For example, the tools and methods that were used for participatory activities (e.g., post-it notes, flip charts and dot-voting) at the workshops might also be considered to facilitate interactive components of the training intervention.

Stakeholder engagement with diverse groups of people can present various challenges. In this research, engagement with only one group of stakeholders who were all healthcare professionals (employed in the same professional role) meant that workshop participants were already aware about the importance of the research topic, felt adequately prepared to take part in the research activities, and had similar views about research priorities, problems, and solutions. Guidance in how to ‘do’ and evaluate stakeholder engaged research is limited. Understanding what works best to achieve stakeholder engagement and involvement in behaviour change research is an important research area. Reporting on collaborations with stakeholders is therefore relevant and is encouraged (376, 505). This report on professional stakeholders’ experiences of participation in interactive workshops contributes to the evidence for stakeholder engagement in designing of implementation interventions in primary care.

Appendix M – Guideline recommended practices for health visitors

Context: prevention of excess weight gain in children aged 0-2 years; National Institute of Health and Care Excellence (NICE) uses a guideline numbering and naming system for easy referencing of the guidelines (157); [PH= Public Health; CG=Clinical guideline; NG= National guideline]

Time and place of visit	Recommended practices	NICE guidelines sources
Antenatal visit at home; (health promoting visit): 28-32 weeks of pregnancy	<ul style="list-style-type: none"> • Offer advice and support to women with a body mass index (BMI) greater than 30 kg/m² • Introduce key messages for prevention of overweight for mother and baby; discuss healthy weight expectations; encourage and promote breastfeeding • Provide advice about responsive bottle feeding for mothers who choose to bottle feed • Explain growth charts in parent held Personal Child Health Record (PCHR), signpost to healthy weight guidance • Advice and information about Healthy Start Vitamins and Vitamin D supplementation 	PH27 (maternal weight management)(158); PH56 (Vitamin D supplementation)(159); CG37 (Breastfeeding/formula feeding advice)(160); PH11 (maternal and child nutrition) (57); complements care provided by midwifery services
New birth visit (10-14 days) at home	<ul style="list-style-type: none"> • Measure weight, length of infant; interpret and monitor child growth • Promote and support breastfeeding; provide advice about responsive feeding when indicated • If faltering weight is identified, refer to national and/or local protocol for management • Promote Healthy Start Vitamin supplementation • Signpost to the Infant feeding and healthy weight advice pages in the parent held PCHR 	CG 7; PH11; NG75 (management of faltering weight) (161); outcomes of this visit enable the HVs to devise a suitable care plan for follow-up
6-8 week assessment; at home or in a clinic	<ul style="list-style-type: none"> • Assess the baby's growth and wellbeing and the health of the parent • Provide information about when to introduce solids; reinforce advice about responsive feeding • Reinforce key messages for the prevention of obesity and healthy weight expectations 	CG37; PH11; NG7 (prevent excess weight gain in children, post weaning) (162); GP led medical review also takes place at this time
1-year assessment (9-12 months); at home or in a clinic	<ul style="list-style-type: none"> • Assess growth including weight and length; identify children who are overweight/obese or experiencing faltering growth; record and interpret results using the centile charts within the PCHR • Using a partnership approach, assess infant's feeding and nutritional intake; promote healthy family mealtimes and appropriate portion sizes • Using "Make every contact count" (MECC) principles, promote the importance of healthy nutrition, Healthy Start and vitamin supplementation, and appropriate physical activity for infants 	PH11; PH56; PH17 (promote physical activity) (163); NG7

Time and place of visit	Recommended practices	NICE guidelines sources
1-year assessment (9-12 months); at home or in a clinic	<ul style="list-style-type: none"> • Offer advice, and initiate a care plan if on-going support or growth monitoring is indicated, plan with parents a growth monitoring review at an agreed time frame • In partnership with the family, set care plan goals and identify interventions (for example, portion sizes, milk volume and physical activities [active play]) 	PH11; PH56; PH17 (promote physical activity) (163); NG7
24-30-month review; at home or in a clinic/health centre/nursery	<ul style="list-style-type: none"> • Assess growth including weight, height, and BMI (from the age of 2, BMI can be calculated and plotted on the appropriate chart) • Record results in the PCHR and patient's record and interpret using the centile charts within the PCHR • Explain the centile charts and the results of measurements using a strength based, non-judgmental approach and MECC principles • Offer support and advice as outlined in the healthy weight pathway protocol for children identified as overweight or obese • Offer advice to parents about healthy diet (nutrition and portion sizes) and physical activity levels for the 2-year-old child as per guidelines. 	<p>PH11; NG7; PH17; CG189 (identifying and assessing risk of overweight in children aged ≥ 2 years) (5); CG43(obesity prevention in children aged > 2)(140)</p> <p>Early Years staff may also carry out an Early Years Foundation Stage progress check at 2 years.</p>
Monitoring of growth; at home or in a clinic/health centre/nursery	<ul style="list-style-type: none"> • If parents wish, or if there is professional concern, babies can be weighed at 6–8 weeks, 12 and 16 weeks • Babies should be weighed no more than once a month from 2 weeks to 6 months of age; once every two months from 6 to 12 months of age; once every three months over the age of 1 year. • Babies should usually be weighed at 12–13 months at the time of routine immunisations. • Most children do not need to be weighed this often; reassure families that they can attend the local child health centre for advice without having their baby weighed. • Measurements need to be interpreted in relation to length, growth potential and any earlier measurements of the baby. 	PH11; NG75; (supplemented by NHS guidance for HVs and parents on infant health and development reviews)

Appendix N – Cards bearing names of barriers and facilitators

Cards bearing the names of these barriers and facilitators that were used for rating of relevance in local context (Stage 1 workshop activities).

Barriers

Practitioner level	Practitioner level	Practitioner level	Practitioner level	Practitioner level
Lack of knowledge, skills, and confidence	Disagreement with guideline content or recommendation	Uncertainty about identifying 0-2-year-olds as overweight or obese	Belief: my advice and support does little to prevent childhood obesity	Belief: prevention of excess weight is primarily the responsibility of the parents/carers
	Practitioner-family interaction	Practitioner-family interaction	Parent/family level	Parent/family level
Lack of support from organisation	Risk of harm to practitioner-family professional relationship	Fear of stigmatising parents and provoking negative reactions	Infant/ child feeding practices increase risk for excess weight gain	Socioeconomic factors make it difficult for families to make changes
Parent/family level	Parent/family level	Parent/family level	Parent/family level	Parent/family level
Parental perception: heavier infants are healthier	Lack of knowledge and skills (parenting)	Lack of motivation/ concern	Complex family situations (multiple health priorities)	Parental overweight and their own lifestyle behaviours
Organisational level	Organisational level	Organisational level	Organisational level	Organisational level
Lack of time/ competing priorities	Lack of practice tools and resources	Inadequate/ inaccessible training opportunities	Whose role is it? Uncertainty about practitioner's role	Lack of collaboration between different practitioner groups
Organisational level				
Lack of support for my role from provider organisation				

Facilitators

Practitioner level	Practitioner level	Practitioner level	Practitioner level	Organisation level
Good knowledge of guideline content	High level of competence (skills and confidence)	Belief: my advice and support make a difference	Ability to use communication strategies that are known to work	Resources for practice (tools to aid decision making and communicating)
Practitioner-parent interaction	Practitioner-parent interaction	Organisation level	Organisation level	Organisation level
Receptive, motivated parents	Positive relationship with family	Accessible, adequate training opportunities	Collaboration between different practitioner groups	Supportive leadership, organisation culture and structure

Appendix O –Illustrations of cards used for priority ranking of the barriers

<p>Practitioner: lack knowledge/ skills, and confidence</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Practitioner belief: my advice and support does little to prevent childhood obesity</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Practitioner: Uncertainty about identifying 0-2 year olds as overweight or obese</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Practitioner: Limited knowledge of guideline content</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>
<p>Practitioner belief: prevention of excess weight gain is primarily the responsibility of the parents/ carers</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Practitioner: Disagreement with guideline content or recommendation</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Practitioner-family interaction: Concern about harm to practitioner-family relationship</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Practitioner-family interaction: Fear of stigmatising parents and provoking negative reactions</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>
<p>Family/child: Lack of motivation to change</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Family: Parents lack understanding and skills (to implement recommended practices)</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Family/child: Socioeconomic factors make it difficult to implement healthy lifestyles</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Family/child: Complex multiple issues (health, social)</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>
<p>Family/child: infant/ child feeding practices that promote rapid/ excess weight gain</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Family/child: parents perceive heavier infants as healthier and sign of good parenting</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Organisation: Lack of time (competing priorities; work overload)</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Organisation: Lack of practice resources (tools and materials for assessment and counselling)</p> <p>How important is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>How changeable is this barrier? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>

<p>Organisation: Lack of collaboration between different practitioner groups</p> <p>How important is this barrier?</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>Organisation: Lack of adequate guidance, information, and training</p> <p>How important is this barrier?</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>Organisation: Lack of support (leadership, culture)</p> <p>How important is this barrier?</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>Family: Parental overweight and own lifestyle behaviours</p> <p>How important is this barrier?</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<p>How changeable is this barrier?</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>How changeable is this barrier?</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>How changeable is this barrier?</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>How changeable is this barrier?</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Appendix P - List of ideas for intervention strategies

List of promising ideas (intervention strategies) identified from the literature presented to Stage 2 workshop participants

Programme level	Intervention strategy (with examples)
At the level of the practitioner and provider organisation	Educational interventions ; such as interactive group based workshops, outreach training by trained peers and experts, continuing medical education, computer based learning, lectures, newsletters
	Enablement interventions (providing resources to reduce barriers and improve the means for practitioners); e.g., practice tools to aid decision making; tools to facilitate weight related communication with patients
	Restructuring the practice environment : organisational changes to increase collaboration among different practitioner groups
	Modelling ; for example, using local opinion leaders (subject experts) to promote evidence-informed practices
	Persuasion ; for example, use of computer generated reminders delivered on paper to practitioners
	Audit and feedback combined with education and/or training interventions
	Training interventions (with a strong practical component for development of practice skills); training topics could include communication skills, motivational interviewing, behaviour change techniques, and cultural competency
Interventions at multiple levels	Interactive group based education and training programmes for practitioners ; Educational group based programme for parents

Appendix Q - APEASE criteria rating of the Intervention functions

Intervention function	Affordability	Practicability	Effectiveness & cost-effectiveness	Acceptability	Side effects/safety	Equity	Comments	Include Yes/No
Education: imparting knowledge and understanding	✓	Yes, if limited to 1-day training	✓	✓	✓	✓	<p>Education met with all the APEASE criteria.</p> <p><u>Affordability</u>: provision of education that would be free to access for HVs has been informally supported by the organisation which is a co-sponsor of this research and commissions the delivery of the HV-led HCP 0-5 service at the research site</p> <p><u>Practicability</u>: information from the workshops and informal discussions with HCP 0-5 managerial staff indicated that providing education would be feasible provided that the intervention will not be too time consuming or burdensome to attend</p> <p><u>Effectiveness and cost-effectiveness</u>: these are not part of a feasibility study but can be evaluated if a pilot trial is planned in the future; educational interventions are more likely to be effective when factors related to the social context and the provider organisations are addressed</p> <p><u>Acceptability</u>: HV staff and their managers have welcomed an education intervention as long as it will not be too burdensome or too time consuming for HVs to attend</p> <p><u>Side effects/safety</u>: the risk of undesirable side-effects from providing education that will be based on evidence based guidelines and recommendations has been judged to be minimal;</p> <p><u>Equity</u>: providing education that will be based on existing recommendations is not likely to substantially increase disparities in existing healthcare provision/health standards</p>	Yes

Intervention function	Affordability	Practicability	Effectiveness & cost-effectiveness	Acceptability	Side effects/safety	Equity	Comments	Include Yes/No
Training: imparting skills	✓	Same as for Education	✓	✓	✓	✓	Similar to education, implementation of skills into routine practice will require organisational support. Delivery of training in skills related to certain practice behaviours (e.g., assessment and monitoring of weight, diet, nutrition, physical and sedentary activities, motivation to change) may be limited due to lack of standardised tools (currently, there is lack of such tools). The comments made above regarding affordability, practicability, effectiveness and cost-effectiveness, acceptability (with the exception of Rehearsal of the behaviour, a frequently used BCT for this function), side-effects/safety and equity of Education also apply for Training.	Yes
Modelling	✓	✓	✓	✓	✓	✓	Demonstration of best practice (indirectly by showing video clips) and directly by trainer and/or an experienced HV from the team (who is considered as a local opinion leader) enacting key practice behaviours is acceptable to HVs. Demonstration of the behaviour is considered as an effective strategy for improving psychological capability (392). This function was assessed as having met all the criteria.	Yes
Environmental restructuring	✗	✗	?	✗	?	?	HVs have emphasised the lack of time and lack of resources as important barriers. They have also highlighted that currently, there is no organisational policy/ guideline that requires them to identify infants as overweight. These barriers are also documented in the literature. On the other hand, the availability of time, practice tools and role support (support staff) have been identified as facilitators. To enable HVs to embed guidelines in their routine practice, these barriers will need to be addressed. However, any restructuring of the practice environment (e.g., additional HV mandated visits, more staff support, better equipment, new guidelines mandating identification of overweight in 0-2 year olds) would require budgetary resources and policy change (at both local and national levels) that is beyond the scope of this intervention. Beyond provision of a training manual (and paper-based educational materials for HVs and parents, as suggested by HVs), restructuring was deemed to be unaffordable and impractical.	No

Intervention function	Affordability	Practicability	Effectiveness & cost-effectiveness	Acceptability	Side effects/safety	Equity	Comments	Include Yes/No
Incentivisation	x	x	?	x	?	x	<p>Incentivisation (financial) as a function for behaviour change was deemed impracticable and not acceptable, in view of the sensitive nature of the topic. Some studies have shown that financial incentives may be effective in changing practices of General Practitioners. The effectiveness and cost-effectiveness of financial incentivisation for increasing compliance with health promotion and prevention care practice (e.g., health visiting practice) is unclear (506). Currently, financial incentivisation to promote preventive care services in the context of UK primary care does not meet any of the criteria.</p> <p>Non-financial incentive (not as a function for behaviour change) in the form of CPD credit will be provided, to promote participation in the training intervention.</p>	No
Restriction	x	x	x	x	x	x	<p>There are already various protocols and guidelines in place. All HVs are registered members of the Nursing and Midwifery Council and are expected to abide by the professional code of conduct of the Council and also the policy regulations of the NHS Trust who employ them. Any new rules or regulations will require change at policy level (locally, if not nationally). Also, HVs' consider their professional autonomy as an important facilitator of their role. Restriction was considered inappropriate.</p>	No
Enablement	✓	✓	✓	✓	✓	✓	<p>Enablement to improve capacity and opportunity to perform the practice behaviours are particularly relevant for this intervention. The intervention is addressing multiple behaviours in practice which are performed alongside several priority competing goal directed behaviours. HVs have expressed keen interest to explore and learn methods that can increase their capacity and opportunity to perform the behaviours. Education and Training functions, the effectiveness of this function in actually improving compliance with guidelines is uncertain but this can be tested at a full trial of the intervention. Enablement interventions are likely to be effective when there is organisational support for practitioners' role.</p>	

Intervention function	Affordability	Practicability	Effectiveness & cost-effectiveness	Acceptability	Side effects/safety	Equity	Comments	Include Yes/No
Persuasion:	✓	✓	?	?	✓	✓	Persuasion (persuading HVs to perform the practice behaviours) emerged as a vital intervention function for this intervention, following analysis of individual HV-level barriers. However, HVs already agree that early life interventions are important to address childhood obesity. Yet, efforts to further persuade them to implement guideline-recommended practices are required, in view of the current evidence-practice gap in this field and stubbornly high proportion of children who are already overweight or obese at school age entry. It was decided to include this intervention function as it meets the APEASE criteria (except effectiveness which can be tested at a full trial)	Yes
Coercion	✗	✗	✗	✗	✗	✗	HVs enjoy a high level of professional autonomy and take pride in the principles of health visiting practices which serve as the foundations of their preventive care. Creating an expectation of punishment will be unacceptable to HVs, either to participate in the intervention or practice implementation. Any form of coercion will lead to non-engagement with the intervention.	No

Appendix R - Cards used for rating of the BCTs by participants

<p>Provides me with updated information about childhood obesity</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>Use of reminders, prompts and cues</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>Provides me with a training pack and resources I can use for practice</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>Provides me positive feedback, and reassurances throughout the session</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5
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<p>Reframe discussing weight issue, focus on health and not on weight</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>There is opportunity to practice and rehearse (Role play)</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>Provides demonstration of good practice (video clips, case studies)</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>Credible source</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5
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<p>Provides us with opportunity to reflect on personal experiences of positive and negative interactions with parents</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>Provides information about outcomes of early intervention and consequences of delaying intervention</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>Provides evidence (UK studies) of parents' expressed need for support for healthy child weight management</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>Provides information on the role of trained nurses in prevention of excess weight in 0-5 year olds</p> <p>How important</p> <p>Least Most</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> <p>How acceptable?</p> <p>Low High</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table>	1	2	3	4	5	1	2	3	4	5
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<p>Action planning: opportunity for me to make plans about how I will go about performing practices that I find particularly challenging</p> <p>How important Least Most</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> <p>How acceptable? Low High</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>Problem solving (make if/then plans): Opportunity for me to identify my own barriers and then my own solutions to overcome them</p> <p>How important Least Most</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> <p>How acceptable? Low High</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>Opportunity to work in small groups, first set easy-to-perform tasks and then proceed to increasingly challenging but achievable tasks</p> <p>How important Least Most</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> <p>How acceptable? Low High</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>There is opportunity for us to informally discuss with peers and colleagues (e.g., at monthly team meetings)</p> <p>How important Least Most</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> <p>How acceptable? Low High</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table>	1	2	3	4	5	1	2	3	4	5
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<p>Provides me with information on how gaps in evidence based practice are linked with 'high impact' areas of health visiting</p> <p>How important Least Most</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> <p>How acceptable? Low High</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table>	1	2	3	4	5	1	2	3	4	5	<p>Provides me with instructions (training manual, video clips) on how to perform the tasks</p> <p>How important Least Most</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> <p>How acceptable? Low High</p> <table border="1" style="width:100%; text-align:center;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table>	1	2	3	4	5	1	2	3	4	5																						
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Appendix S – Rationale for the selection of the initial list of behaviour change techniques

BCT (label); intervention function	Reasons for choosing the BCT
Problem solving (1.2) (Enablement)	The findings from the SR and from the workshop strongly indicated that practitioners believe that discussing a child’s weight and other weight related behaviours is challenging (sensitive issue, obesity stigma), particularly with parents who themselves are overweight or there are other social and cultural factors that makes it more difficult. Working with HVs to identify potential problems related to issues that are frequently encountered in real-world practice settings and then identify solutions to overcome those barriers, has the potential to induce positive beliefs about their capability to successfully perform the behaviour. This BCT was considered after taking into consideration the substantial evidence in the published literature, supported by experts’ opinion (392) for the potential of this BCT to facilitate behaviour change.
Action Planning (1.4); (Enablement)	The findings of the SR and data from the workshops clearly indicated that practitioners perceive that performing some of the recommended behaviours as challenging. It is relevant to enable HVs to feel a sense of control of how they will perform the recommended practice behaviours (especially those they find more challenging to implement). Detailed planning of the performance of the behaviour (in particular, those they consider as more challenging to perform) at the training session can enable HVs to feel a sense of control over how they will perform the behaviour in the practice setting. Action planning skills have been shown to help nurses improve their clinical practice performance (507). Evidence published in behaviour change literature (391) and opinion of experts (392) suggest that this BCT facilitates behaviour change by triggering of the behaviour.
Discrepancy between current behaviour and expected practice (1.6) (Persuasion, Enablement)	The SR found clear evidence that many practitioners (including GPs and health visitors in UK) do not consistently implement the recommended practices, with wide variation among individual practitioners in implementation of the relevant practices. Therefore, it was deemed relevant to draw HVs’ attention to the published evidence in the context of their key role in meeting two high impact public health outcomes: breastfeeding and healthy weight, healthy nutrition. Although there is very limited evidence of the effectiveness of this BCT in published literature, experts believe that drawing attention of the individual between current behaviour pattern and expected behaviours can facilitate behaviour change (392)
Social support (practical) (3.2); (Enablement)	HV’s have described the importance of opportunities to engage in informal conversations with their peers and colleagues about the challenges associated with their practices related to excess weight prevention in very young children. The provision of social support to the person who is attempting to change behaviours is strongly recommended by experts (392).
Instructions on how to perform the behaviour (4.1); (Training)	Findings of the SR and from the workshops have identified the lack of training as an important barrier. HVs have emphasised upon the need for training on how to perform the recommended practices in a manner that has positive outcomes for both HV and parent. This BCT has the potential to improve HVs’ knowledge, skills, and beliefs about their capability to perform the recommended tasks, as suggested by the evidence in the published literature (391) about the role of this BCT in facilitating behaviour change; inclusion of this BCT in a behaviour change intervention is supported also by experts’ opinion (392)

BCT (label); intervention function	Reasons for choosing the BCT
Provide information about health consequences (5.1); (Education)	The findings of the systematic review (SR) and theoretical analysis of the barriers identified at the Health Visitor (HV) level from Stage 1 workshops clearly showed the importance of providing information to HVs about obesity during early years and its prevention. HVs have explicitly identified a need to gain knowledge and understanding of excess weight prevention in infants. Systematic reviews (202, 204, 397) have highlighted the beneficial impact of obesity training interventions on practitioner's knowledge, skills, confidence, and practice patterns.
Salience of consequences (5.2); (Persuasion)	The findings from the SR and the workshops indicated that some practitioners are not convinced that obesity prevention must start in infancy and are not aware of the risks of inaction and delay in intervention. Many practitioners believe it is appropriate to discuss overweight prevention only after age of 2 and half years. It is relevant, therefore, to inform HVs about the consequences of delay and also the potential successful outcomes of early intervention. Experts believe this BCT has the potential to induce behaviour change, by changing the person's beliefs about consequences of performing (or not performing) the recommended behaviour (392)
Demonstration of the behaviour (6.1); (Training, Modelling)	The findings of the SR and data from the workshops clearly indicated that practitioners perceive that performing some of the recommended behaviours (e.g., sensitively raising the topic of weight of an overweight parent who appears to lack interest and not engaged) as challenging. At the workshops, HVs have expressed that they are keen to see experts perform some of the key practice behaviours (e.g., live demonstration by intervention facilitator, or video clips), for the purpose of their own learning and skills development. The published literature (391), supported by opinion of experts (392) indicate that this BCT has the potential to induce behaviour change by creating positive beliefs about capability in the practitioner.
Social comparison (6.2); (Persuasion)	The findings of the SR and data from workshops indicated that many HVs believe that their prevention efforts are not effective in producing the desired impact on children and families. They believe that their time and resource limited brief consultations are likely to not succeed, given the effects of the 'obesogenic' environment of the modern world. Providing information on positive outcomes of trained nurse-led interventions (the evidence for this is rapidly growing) has the potential to induce changes in HV's existing beliefs about the outcomes of the recommended practices and shape positive attitudes toward performing them. The evidence in the published literature (391) and experts' opinion (392) suggest that this BCT has good potential in facilitating HV behaviour change.
Information about others' approval (6.3); (Persuasion)	The findings of the SR revealed that some practitioners hold the view that (1) parents do not want to, or are not interested, in discussing their child's weight and weight related behaviours; and (2) parents get upset when they raise the topic of the child's weight (this is because of the stigma associated with obesity). The SR also identified that a practitioner's beliefs about what their peers or members of another practitioner group believe and/or implement can influence their practices (for e.g., promoting breastfeeding, discussing overweight in an infant). These views were also expressed by HVs at the workshops. This BCT is believed to facilitate behaviour change by acting on social influences, norms, and subjective norms, based on the evidence from a literature synthesis study (391) and an expert consensus study (392)

BCT (label); intervention function	Reasons for choosing the BCT
Prompts, cues (7.1): discuss the role and use of prompts; (Enablement)	Prompts and cues are believed to facilitate behaviour change by aiding practitioner’s memory, attention and decision making processes. The findings of the SR indicated that decision making tools can be particularly helpful for HVs who are required to manage multiple competing role-specific behaviours in time constrained environments. HVs at Stage 1 and 2 workshops have indicated that decision making tools can act as facilitators of HV’s practice behaviours. Evidence from a literature synthesis study (391) and an expert consensus study (392) support the rationale of including this BCT.
Behavioural practice/ rehearsal (8.1); (Training)	Rehearsal of the behaviour is widely used as a component in skills training workshops and in behaviour change interventions. There is a substantial evidence base (391) supported by strong consensus among experts(392) which endorses the view that this BCT can help in improving skills and facilitate behaviour change by inducing positive beliefs in the individual about their capability to successfully perform the behaviour. HVs have expressed keen interest in developing skills related to raising the topic of weight in a sensitive manner and providing advice and support. The SR too found strong evidence that skills development is an important training need for practitioners.
Graded tasks (8.7): (Training, Enablement)	The findings from the SR and from the workshop strongly indicated that practitioners believe that discussing a child’s weight and other weight related behaviours is challenging (sensitive issue, obesity stigma), particularly with parents who themselves are overweight or there are other social and cultural factors that makes it more difficult. Prompting HVs to set easy to perform tasks, making them increasingly difficult, but achievable until they have performed the behaviour can be useful in an educational setting, and can potentially induce positive beliefs about their capability to successfully perform the behaviour. However, in the reality of the practice setting, it is unrealistic to expect that HVs will be able to take a staggered approach to performing the recommended practice behaviours. The evidence from the published literature (391) and expert opinion (392) strongly suggests that this BCT can induce positive beliefs about capability.
Credible source (9.1); (Persuasion)	At the workshops, HVs have emphasised that the training materials used in the intervention are credible and the intervention facilitator (trainer) must have the appropriate credentials. Experts believe that, to shape an individual’s general beliefs and attitudes about a particular behaviour (with the purpose of persuading the individual to perform the behaviour), the information that is provided to them must originate from a credible source (392).
Adding objects to the environment (12.5); (Enablement)	At the workshops, HVs have expressed the need for practice tools and aids to support implementation of the recommended practices. They also stated that they are keen to receive – as part of the intervention - a training pack and some resources (e.g., educational materials and paper- based practice tools for HVs, and educational materials for parents). Availability of relevant practice based tools are helpful for practitioners who have to manage several competing role-specific tasks and time constraints. The SR findings and evidence in the published literature (209) emphasise the facilitator role of practice tools and resources for practitioners. Experts believe that adding resources can also trigger the desired behaviour (392).

BCT (label); intervention function	Reasons for choosing the BCT
Framing/ reframing (13.2); (Persuasion, Enablement)	The findings of the SR and the workshops indicated that some practitioners are hesitant to raise the topic of weight and weight related behaviours because of the sensitive nature of the topic and the stigma associated with obesity. It is relevant to suggest to HVs that providing advice about excess weight prevention and management is particularly important given greater difficulties for parents (especially parents who are overweight) to initiate the topic. The literature also recommends that framing discussions about promoting healthy weight in the context of promoting overall health of the child is more likely to produce the intended outcomes (187). According to the published literature (391) and experts' opinion (392), this BCT facilitates behaviour change by changing the person's attitudes toward performing the behaviour.
Verbal persuasion of capability (15.1) (Persuasion, Enablement)	The findings from the SR and the workshops revealed that practitioners lack confidence in raising the topic of weight of the child and discussing feeding practices with parents. Therefore, providing verbal support and reassurance from a credible intervention facilitator/trainer throughout the training session, telling HVs that they can successfully perform the recommended practices is relevant. There is substantial evidence in the published literature (391) and consensus among experts (392) that this BCT can potentially facilitate behaviour change by inducing positive beliefs about capability.
Focus on past success (15.3): (Enablement)	The SR found that many practitioners feel demotivated because they believe their role has limited impact on children, owing to numerous other barriers at the level of the parent. At the workshops, HVs expressed lack of optimism about their prevention and health promotion work with regard to child healthy weight. There is evidence in the health visiting literature of the positive impact of reflection on practice (Communities of Practice) and focusing on success stories on inducing positive beliefs and attitudes, and improving practice (508). Experts believe that this BCT is capable of facilitating behaviour change by inducing positive beliefs in the person about their ability to perform the behaviour (392); there is some supporting evidence also in the published literature that it is useful (391)

Appendix T - Suggested form of delivery of the intervention informed by the TIDieR framework

Delivery elements and Delivery features	Description
Provider (who delivers and facilitates the intervention?) [TIDieR: Who]	
Professional background	Preferred: health visiting; Infant nutrition
Professional experience	To be confirmed
Number of providers	To be confirmed
Delivery format (what are the methods of delivering the training intervention?) [TIDieR: How]	
Mode of delivery	Face to face facilitated interactive training workshop for small groups of HVs (suggested 12 HVs per session)
Materials (what materials are being used to deliver the intervention content?) [TIDieR: What?]	
Pre- workshop reading material (could be made available online) At the workshop: Training pack (containing all teaching materials and a workbook), guidebook for families, PowerPoint slides, videos of examples of good practice, Case stories (health visiting communities of practice)	
Procedures (what procedures will be used to deliver the intervention?) [TIDieR: What?]	
Mix of didactic lectures and interactive skills development activities; presentations aided by PowerPoint slides; video clips; self-reflection on practice; case stories (health visiting community of practice); individual and group based activities (e.g., context-bound communication training skills, action planning, coping planning, graded tasks); discussion and feedback from peers and facilitator(s); provide certificates of attendance to participants	
Setting (Where is the intervention being delivered?) [TIDieR: WHERE?]	
Sessions are delivered separately to each location based HV team; priorities for HVs are: a facility that is 'local' (not involve too much travel time), adequately equipped to host an interactive training workshop, and has adequate parking facilities	
Intensity (What is the intensity with which the intervention is being delivered?) [TIDieR: When and how much?]	
HV's have suggested that participation is likely to be higher if intervention sessions are delivered separately to each location based HV team. Each training session will take one full working day (5 hours and 35 minutes with an additional 70 min for breaks). All health visitors will have the opportunity to participate once in the training workshop.	

Appendix U - Acceptability questionnaire

Question ¹ (Theoretical frame of acceptability construct) (452)	Strongly disagree		Disagree		No opinion/ neutral		Agree		Strongly agree	
	Start	End	Start	End	Start	End	Start	End	Start	End
I believe I will enjoy taking part in the training (affective attitude)										
It will require effort for me to take part [disagree = less effort] (burden)										
I believe the training will be effective (perceived effectiveness)										
I believe that the contents of the training and the methods that will be used to deliver will be correct and proper (ethicality)										
Participating in the training will interfere with my other priorities [disagree=less interference] (opportunity costs)										
I am confident that I will be able to take part in the training activities (self-efficacy)										
I believe I will understand the contents of the training and the purpose of the training activities (intervention coherence)										

¹ The phrasing of the questions will be adapted as appropriate for the data collection point.

Example: Time point T1 (Start): I will enjoy taking part in the training.

Time point T2 (End): I enjoyed taking part in the training.

Appendix V - Training evaluation questionnaire

Instructions:

Please rate your experiences of taking part in the training on a 1 to 5 scale:
 1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree

Question	1	2	3	4	5
1. It was easy for me to understand the purpose of the training intervention.					
2. The information that was provided (e.g., joining instructions, programme information, directions to training venue) was comprehensive and very useful					
3. The venue of the training was suitable for achieving the outcomes of the training					
5. The learning and training outcomes of the training were clearly described					
6. The learning and training materials that have been provided for my use are relevant to my needs					
7. The structure of the training session was appropriate for achieving the learning and training outcomes					
8. The activities and delivery methods were appropriate for achieving the learning and training outcomes					
9. The facilitators demonstrated the appropriate level of knowledge and skills to effectively deliver the training					
10. I was able to work together with others in group activities easily					
11. I felt engaged with the learning and training activities					
12. I was able to combine my existing knowledge with the ideas presented at the training, to contribute to discussions					

If there were any areas of the training session that you thought were particularly strong or weak or that were not covered in the questions, please write your comments below.

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