

Chapter 4: Nutrition

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Children need nutritious food for proper growth and development.
The Food Commission, 2000¹

Appreciation of the links between early life, nutritional status and health in later life has grown considerably since *Growing up in Britain* was published in 1999. The scientific evidence linking early diet to lifelong physical and mental health has strengthened considerably.² The implications of these findings, for the current and future economic welfare of societies, are clear, and thus government policies that bear upon the nutrition of parents and their young children have increasing importance.

Growing up in Britain envisaged a range of interventions at the individual, community and macro-economic levels. Although many of the suggestions made have since been incorporated in policy, implementation has often been incomplete and therefore ineffective. It is timely to review the current nutritional health of young children, the impact of policy change and the gaps that still need to be addressed.

4.1 The nutritional needs of children aged 0 to five years

The years between 0 and five are demanding for the developing child – years in which they acquire many physical, social and psychological structures for life and learning. Unfortunately, many 0 to five year olds are not being aided in these tasks by healthy and balanced nutrition: the problem is most acute for those children who are born into and live their early years in poverty.

There is no doubt about the health benefits of breastfeeding during early infancy. All current guidelines, including those from the DH, recommend exclusive breastfeeding for the first six months after birth. The diet of the early years of life needs to be relatively more ‘nutrient dense’ than the middle years. This is because the physical requirements for nutrients must be met within a relatively small number of calories and generally small quantities of food.

Complementary feeding (colloquially known as ‘weaning’) begins when semi-solid food starts to be given in addition to milk. The DH advises that at about six months, babies are ready to be moved onto a mixed diet. The ‘weaning’ period is not only important because of the need to introduce nutritional variety and replenish iron stores; it is also a critical period within which to introduce and accustom infants to the experience and taste of different foods. There may be an important imprinting function, making this

the ideal time to introduce particular foods such as vegetables and fruits. There is evidence that the pace at which foods are introduced in the second six months of infancy may affect food preference behaviour throughout life.³ Inappropriate weaning practices are common⁴ and need to be addressed by education and the input of health professionals. Families with lower educational attainment and of lower social class particularly need such support.

4.2 Fetal nutrition

A balanced diet during pregnancy helps to protect the mother's health and to control her level of weight gain. Current UK recommendations for diet before and during pregnancy are given in **Appendix 3**. The embryo and fetus receive all their nutrients directly from the mother. It is important that she achieves nutritional status adequate to support her pregnancy prior to conception and maintains this throughout. Unbalanced nutrition will also cause metabolic and hormonal changes in the mother. In animal models this can affect the allocation of stem cells, embryonic and placental lineages, and have long-term effects on offspring growth and health. In humans, maternal diet and body composition affect the growth of the early embryo, making a focus on diet before pregnancy as important as that during pregnancy. Later in gestation, when fetal growth is maximal, undernutrition leads to a range of adaptive responses such as redistribution of blood flow in the fetal body and changes in the production of fetal and placental hormones that control growth.⁵

These responses may include changes in placental transport function, an area of research about which we currently know relatively little.⁶ Even without changes in overall fetal body size, the growth of certain organs such as the heart and kidney can be altered. Thus, even fetuses of normal birth size may have mounted adaptive responses to unbalanced nutrition and are therefore phenotypically altered. If the nutritional challenge is too great or too prolonged for these adaptive responses to cope, eventually slowing in overall fetal body growth must result, leading to low birth weight. In late gestation, this growth restriction is likely to be asymmetrical, with the head being less affected than the body.

Chapter 8 considers, in greater detail, the impact of fetal nutrition on health in later life and the developmental origins concept.

4.3 Young infants: the first six months

The contribution of breastfeeding to health

It is beyond doubt that breastfeeding improves the health of babies and their mothers even in an industrialised country like the UK. Breast milk provides all the nutrients required at this age, in a form that is hygienic and easy to digest. The protein, carbohydrate and fat profiles are unique to breast milk and differ in many ways from other animal milks.⁷ Breast milk also contains a range of bioactive components,

including anti-microbial and anti-inflammatory factors, digestive enzymes, hormones and growth factors.⁸

The BMA's 2009 report *Early life nutrition and lifelong health*⁹ highlights the importance of breastfeeding and raises concerns about the need to increase breastfeeding rates in the UK – including addressing the inequalities in breastfeeding between socioeconomic groupings. Many of the themes from the 1999 report are revisited, establishing current thinking about the relationship between early life nutrition and later health; to what degree inequalities in nutrition still exist; and what factors are influential in determining consumption patterns. Concerns about the future health of children have grown further since the 2009 publication. Public health initiatives should focus attention on the importance of maternal and infant nutrition, in relation both to poor and unbalanced diet and to excessive energy intake. This is true in both high-income countries such as the UK and also in low-and middle-income countries.

Systematic reviews of the international literature have indicated that infants who are not breastfed are at greater risk of acute gastrointestinal and respiratory tract infection during the early months of life.¹⁰ UK hospitalisation data, from 2007, have confirmed this.¹¹ Later in life, infants who are not breastfed are more likely to be obese and are disadvantaged in cognitive attainment.^{12,13} Mothers who do not breastfeed are at increased risk of later breast cancer.^{14,15} One difficulty with interpreting the literature is strong confounding by social class, educational attainment and smoking, particularly in the UK where these remain very prevalent influences (this is discussed in further detail in the following paragraphs).^{16,17} Another difficulty is that the effects of breastfeeding are graded and strongest among those who are exclusively breastfeeding, yet exposure to exclusive breastfeeding can be difficult to quantify and is not clearly accounted for in many studies.

During the early years, particularly the first 12 months, the pattern of weight gain shown by infants who are exclusively or predominantly breastfed differs from that seen in formula-fed infants.¹⁸ This observation underlies the international multicentre study of growth in healthy breastfed infants which led to the publication of the 2005 World Health Organization (WHO) international growth standard. In 2007, the UK adopted this¹⁹ and new UK-WHO growth charts were launched nationally in 2009. This development is conceptually important because it clearly signals breastfeeding and the pattern of growth associated with it as normative descriptors of infant health.

The initiation of breastfeeding in the UK

The national Infant Feeding Survey (IFS) is conducted every five years; the latest data are from 2010¹⁶ (see **Box 4.1**). These reports provide a wealth of information about variations in feeding practice, and factors that influence the type of milk and duration of milk feeding. They also detail trends in feeding over time. In the UK, exclusive

breastfeeding is recommended up to the age of six months. The IFS shows, however, that 1 per cent of mothers are exclusively breastfeeding at six months. Current guidelines are to introduce solid foods from six months, to provide a varied diet that includes starchy foods, fruit and vegetables and meat and fish, and to encourage the use of home-prepared rather than commercial baby foods (see **Appendix 4**).

The IFS shows that there are strong relationships between the mother's socioeconomic status and educational attainment and breastfeeding prevalence – these factors are associated with both initiation rates and breastfeeding duration. In the UK Gateshead Millennium Baby Study (1999/2000), 84 per cent of mothers with higher education initiated breastfeeding compared with 25 per cent of mothers with no educational qualifications.²⁰

Box 4.1: The UK IFS 2010 findings on breastfeeding¹⁶

- Initial breastfeeding rate increased from 76 per cent in 2005 to 81 per cent in 2010 in the UK (83% in England, 74% in Scotland, 71% in Wales and 64% in Northern Ireland).
- Across the UK, 69 per cent of mothers were exclusively breastfeeding at birth in 2010. At one week, less than half of all mothers (46%) were exclusively breastfeeding, while this had fallen to around a quarter (23%) by six weeks.
- Almost three-quarters of mothers (73%) had given their baby milk other than breast milk by the age of six weeks. This proportion rose to nearly nine in ten (88%) by six months.
- Almost half (49%) of all mothers who had prepared powdered infant formula in the last seven days had followed recommendations for making up feeds, for example, using boiled water (allowed to cool to 70°C). This is a substantial increase since 2005 when 13 per cent did so.

Breastfeeding rates in the UK are much lower than in many European countries – for example, 90 per cent of babies in a nationally representative sample studied in Norway were exclusively breastfed from birth, and high rates were still present at one, four and six months.²¹ The proportions of mothers still breastfeeding at four months and six months were 44 per cent and 7 per cent respectively. There were also strong negative associations with the Townsend score, a measure of deprivation based on residential postcode.

The 2010 IFS, encouragingly revealed a rise in the proportion of women initiating breastfeeding ('incidence'), accompanied by a rise in the proportion of women breastfeeding at later stages in the first year ('prevalence').¹⁶ There have been marked increases in regions of the UK (particularly Scotland and Wales) where the incidence and

prevalence of breastfeeding has historically been lower than England. Encouragingly, increases among younger women and those in lower social class groups were also noted, though clear geographical, educational and socioeconomic inequalities remain. For example, the 2010 statistics for England show that among managerial and professional classes, 90 per cent of mothers initiated breastfeeding, compared to 71 per cent of those who had never worked. Similarly 91 per cent of those who completed their education beyond the age of 18 initiated breastfeeding, compared to 63 per cent of those who left school at the age of 16 or under.¹⁶

Analysis of the 2005 statistics reveals that, in contrast to the increase in initiation, the proportion of women who stop breastfeeding at each stage of the survey has not changed since 1975 (see **Figure 4.1**). Nationally, 40 per cent of women stop breastfeeding in the early weeks when the rate of discontinuation is highest (see **Box 4.2**).

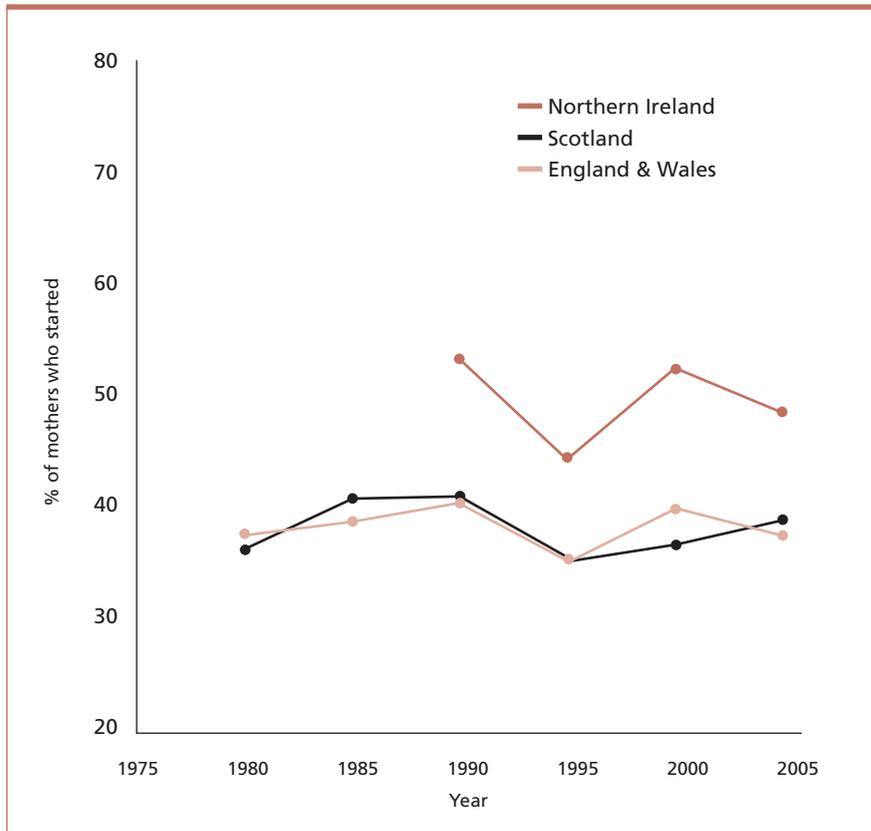
Box 4.2: Reasons why mothers do not breastfeed or cease breastfeeding early²²

A 2006 focus group study in the UK²² suggested further detail of the reasons women may not breastfeed or why they stop breastfeeding early. These were as follows.

- The attitude of other people – women felt that breastfeeding in public was unacceptable and embarrassing, while bottle feeding was accepted by everybody and in all places. A lack of places to breastfeed out of sight restricted women's ability to get out of the house. This may be a bigger issue for low-income women, who may not have the option of breastfeeding in the car. Some women reported breastfeeding in public toilets as the only option. Women wished that cafés and shops could provide places to breastfeed with some privacy.
- Attitudes of family and friends – some women said that even family and friends found it 'repulsive' to be in the same room when they were breastfeeding. Some grandparents thought it excluded them from having the chance to feed the new baby. It was clear that the opinion of family and friends was a stronger influence than that of health practitioners.
- Lack of knowledge – women vaguely knew that breastfeeding was supposed to be beneficial, but they could not name any benefits, and were not convinced about them. In the study only one woman had learnt at school about benefits of breastfeeding; most did not hear about it until they were pregnant. Feeding was not well covered in antenatal classes.
- Lack of professional support – women experienced difficulty in trying to establish breastfeeding but were unwilling 'to bother the midwife'. Bottle feeding seemed easier.
- Experience – breastfeeding seemed difficult and painful, and many women experienced problems, ranging from getting the baby latched on, sore nipples, and disturbed sleep. Women, especially adolescents, complained of a lack of freedom to travel/socialise/work.
- Worry about baby's weight gain – women said that health visitors were 'always worried about weight gain'.

Although some women in this study mentioned the benefits of breastfeeding – including feelings of wellbeing and relaxation during feeds, convenience (less washing up), and less expense, it is clear that there are significant barriers for women in the UK which impact on their choice to breastfeed.

Figure 4.1: Data from the consecutive UK quinquennial surveys of infant feeding on the proportion of mothers who stop breastfeeding by the time the baby is six weeks old



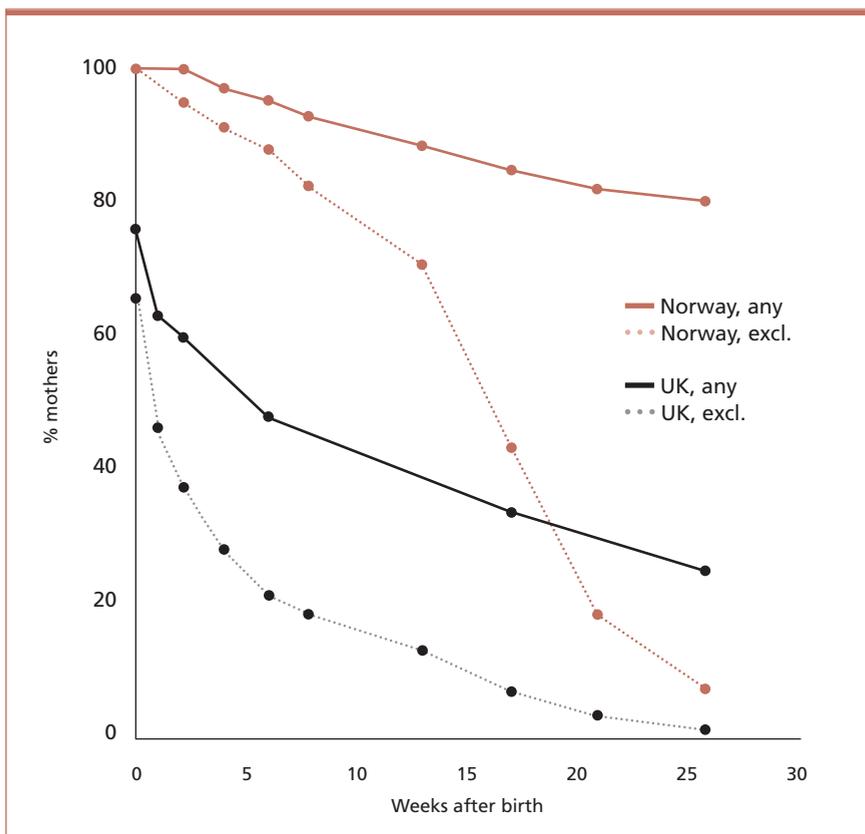
Source: Compiled by Dr Max Davie (Consultant Paediatrician, Mary Sheridan Child Development Centre, Lambeth).

This pattern of infant feeding contrasts sharply with that observed in countries where breastfeeding is more prevalent (see **Figure 4.2**). The reasons women stop breastfeeding during the early weeks are well characterised (see **Table 4.1**). A belief that there is 'insufficient milk', nipple pain and breast pain account together for the majority.¹⁶ It is clear that women do not stop by choice alone, as 63 per cent of those who stop in the early weeks say that they would like to have breastfed for longer had they been able.¹⁶ These problems could be prevented by more effective provision of breastfeeding support around the time of birth and during the early weeks.¹⁷ It is noteworthy too that lower social class and lower educational attainment correlate strongly with early discontinuation.²³ This may well indicate inequality in the ability to access early support

services. These high discontinuation rates suggest that early breastfeeding support in the UK is ineffective and needs to be intensified, particularly after discharge from hospital. Focusing provision of trained support at this stage, when rates of discontinuation are highest, is likely to yield considerable health gains.^{2,17}

Figure 4.2: Patterns of breastfeeding in Norway²¹ and the UK¹⁶

British mothers discontinue breastfeeding (or lose exclusivity) as a consequence of early formula introduction whereas Norwegian mothers introduce non-milk complementary foods much later.



Source: McAndrew F, Thompson J, Fellows L et al (2012) *Infant feeding survey 2010*. London: The Information Centre; Lande B, Anderson LF, Baerug A et al (2003) Infant feeding practices and associated factors in the first six months of life: the Norwegian infant nutrition survey. *Acta Paediatrica* 92: 152-61.

Table 4.1: Reasons given by mothers in the UK for stopping breastfeeding by baby's age when breastfeeding ceased, 2010

	Total	Baby's age when breastfeeding ceased					
		Less than 1 week	1 week, less than 2 weeks	2 weeks, less than 6 weeks	6 weeks, less than 4 months	4 months, less than 6 months	6 months, less than 9 months
		%	%	%	%	%	%
Insufficient milk	31	22	34	35	39	34	23
Baby would not suck/rejected, would not latch on	19	27	23	22	14	13	17
Painful breasts/nipples	12	22	19	17	10	6	4
Baby feeding too often/constantly/ every x hours/ hungry baby	10	5	7	11	13	13	8
Breastfeeding took too long/was tiring, too demanding	8	5	8	8	11	9	4
Returned to work/college	6	0	0	0	4	13	20
Mother ill/on medication that prevented breastfeeding	6	7	9	7	5	5	4
Domestic reasons (coping with other children/relatives)	5	4	6	6	7	6	2
Unweighted bases	5816	1052	348	1107	1355	855	870
Weighted bases	5699	886	376	1117	1345	815	875

Base: All Stage three mothers who stopped breastfeeding during survey period (responses mentioned by 5% or more in 2010 show n).

Source: McAndrew F, Thompson J, Fellows L et al (2012) *Infant feeding survey 2010*. London: The Information Centre. Reproduced with the permission of The Information Centre.

Interventions to encourage breastfeeding

There is strong evidence that UNICEF 'Baby Friendly' accreditation of maternity providers increases the incidence and the prevalence of breastfeeding, notably from a cluster-randomised study performed in Belarus.²⁴ Within the UK, the number of units accredited as 'Baby Friendly' has risen over the last decade, particularly in Wales and in Scotland where national data show that the incidence of breastfeeding has risen substantially.^{16,25,26} It is not clear, however, whether UNICEF 'Baby Friendly' accreditation reduces the proportion of mothers who discontinue breastfeeding. Postnatal care guidance from NICE recommended that 'All healthcare providers (hospitals and community) should implement an externally evaluated structured programme that encourages breastfeeding, using the Baby Friendly Initiative (BFI) as a minimum standard'.²⁷ This recommendation appears to have substantially increased the number of healthcare providers applying for UNICEF 'Baby Friendly' accreditation.

Systematic reviews have identified interventions and desirable qualities of support that women need to enable them to breastfeed.²⁸ Ideally support should be delivered across the perinatal period, both antenatally and postnatally. It should be proactive, as women who are experiencing problems may not ask for help even when it is available. Successful breastfeeding requires close support during several weeks after birth, including help from family and healthcare personnel. The 2006 NICE *Postnatal care guidance*²⁷ and subsequent *Guidance on Improving the nutrition of pregnant and breastfeeding mothers and children in low-income families*²⁹ made a number of recommendations directed to improving the quality of breastfeeding support in the UK but there has not been a national audit of implementation. Anecdotal evidence suggests that implementation is patchy and at a national level still generally lacking.

There is a need also, to increase the competency of health professionals in delivering breastfeeding support and there have been important professional developments in this area. For example, the UNICEF UK BFI now accredits modules teaching breastfeeding in undergraduate courses of nursing and midwifery. The University of York and Humberside NHS Region, have also collaborated to develop a distance learning course providing modules at master's level open to all health professionals. These are important initiatives that will better equip the NHS workforce to deliver breastfeeding support and remain up to date with the expanding evidence base in this area.

A 2012 report from UNICEF concludes that investment to increase and sustain breastfeeding rates will also provide a rapid financial return on investment.³⁰ There are large costs to the health service of treating diseases that are associated with not breastfeeding. The savings associated with not having to treat gastrointestinal and lower respiratory tract infections, acute otitis media and necrotising enterocolitis in infants would yield considerable cost savings.³¹ When a broader view is taken, and

cases of breast cancer, Sudden Infant Death Syndrome, poor cognitive development and early years' obesity are included, additional cost savings accrue correspondingly.³¹

Breast milk substitutes

If mothers cannot, or choose not to, breastfeed, there is a range of commercially available formula milks designed as total substitutes for breast milk during the baby's first year. They are the only safe alternatives to breast milk and infants can grow and develop normally on these feeds. The content of infant formula is tightly regulated and must meet compositional criteria required by statute in the Infant and Follow-on Formula Regulations.³¹ These regulations also govern the labelling and marketing of infant formula. This is important, firstly to ensure that parents who have elected not to breastfeed receive accurate practical and factual advice on the use of infant formula, independently from commercial interests. Secondly, this ensures that the promotion of breast milk substitutes does not undermine breastfeeding. Although it is 30 years since ratification of the International Code of Marketing of Breastmilk Substitutes,³² it remains debatable whether European and national legislation adequately incorporates all its Articles.

It is imperative that mothers who are not breastfeeding receive practical instruction on the safe reconstitution and use of infant formula, particularly since advice changed in 2006 in response to reports of infantile *Cronobacter* (formerly *Enterobacter sakazakii*) infection through contamination of powdered formula.³³ Studies in this area have consistently shown that many mothers do not reconstitute powdered formula properly, generally tending to err towards over-concentration of the feed.³⁴ Recommendation 14 of NICE Public Health Guidance 11, asked commissioners and managers of maternity and children's services, to ensure that mothers have access to a qualified health professional. This will ensure that they are informed about the use of infant formula from a source free of commercial influence. Health professionals must also have access to independent scientific and factual information on the composition of the many branded formulas available, so that they can advise mothers. This need has recently been met by publications from the BFI and the *Caroline Walker Trust*.³⁵ *First Steps Nutrition Trust* also provides evidence-based information and resources about the importance of good nutrition from pre-conception to five years.³⁶ The UK BFI standards require Trusts to demonstrate that mothers who elect to formula feed their baby are shown how to make up a bottle of infant formula before they are discharged from the hospital unit. The Baby Friendly standards also proscribe promotion and marketing of breast milk substitutes through the healthcare system.

European legislation, introduced in May 2011, has permitted the use of health claims in marketing of infant formula.³⁷ It is uncertain what impact this may have on the sales of infant formula and, in particular, whether it may encourage the use of infant formula over breastfeeding. The philosophy that underpins the justification of a health claim on

infant formula is questionable: infant formula is unique as a dietary product that supplies the entire nutrient intake during a vulnerable period of development. A health claim may be justified if sufficient scientific evidence exists to link the addition of an infant formula ingredient to an improvement in physiological function. On the basis that no infant should be deprived, there would be a strong case for the ingredient in question to be a statutory compositional requirement of the Infant and Follow-on Formula Directive.³⁸

4.4 Infant feeding six to 12 months

The DH recommendations on breastfeeding and on the introduction of solid food were revised in 2003,³⁹ in the light of recommendations from WHO⁴⁰ and the UK's Scientific Advisory Committee on Nutrition (SACN).⁴¹ Current UK policy is set out in **Box 4.3**. It is recommended that complementary feeds are introduced from the age of six months onwards, and that infants progress onto foods consumed by the rest of the family by around one year. The optimal diet for infants at this stage is not known, and is certainly not 'innate knowledge' for parents. Detailed guidelines are available on suitable foods at every stage (see **Appendix 4**). Key recommendations are a varied diet, adequate energy density, high-quality (preferably animal) protein sources, and fresh fruit and vegetables.

Examination of the 2010 IFS data,¹⁶ suggest that while feeding practices are changing, most mothers in 2010 were not following the DH guidelines, since three-quarters of mothers (75%) had introduced solids by the time their baby was five months old. This suggests that the revised advice from the DH has been associated with a marked reduction in the proportion of mothers introducing solid foods before four months of age. There has been a marked trend towards mothers introducing solid foods later in 2010 compared with 2005. In 2005, 51 per cent of mothers had introduced solid foods by four months, but by 2010, it had fallen to 30 per cent. This change seems likely to benefit infant health.¹⁷

Box 4.3: DH Infant Feeding Recommendation (2003)

Breast milk is the best form of nutrition for infants

- Exclusive breastfeeding is recommended for the first six months (26 weeks) of an infant's life.
- Six months is the recommended age for the introduction of solid foods for infants.
- Breastfeeding (and/or breast milk substitutes, if used) should continue beyond the first six months, along with appropriate types and amounts of solid foods.

All infants should be managed individually so that insufficient growth or other adverse outcomes are not ignored and appropriate interventions are provided.

Source: Department of Health (2003) Infant feeding recommendation. London: Department of Health.

Reproduced with the permission of the Department of Health.³⁹

During the second six months of infancy, infants will readily accept a widening range of new tastes and textures; this tendency has accordingly been termed 'neophilia'. Empirical studies have shown that breastfed infants accept new foods more readily than those who were not breastfed. This may be because they have been previously exposed to these flavours through breast milk. It is important that parents capitalise on this tendency and diversify the infant diet aiming to achieve provision of three meals a day, with snacks between meals, by the age of one year. There is clear evidence that family eating habits govern the types of food provided for infants and young children.⁴² Those families that pursue dietary habits characterised as prudent (or 'healthy') are more likely to offer their children diets high in vegetables and fruit; these tend also to be families from more privileged social groups who also smoke less frequently and consume less alcohol. This suggests a role for more individual counselling, both peer and professional, during the period of complementary feeding and current research is evaluating delivery to less privileged families through Sure Start centres.

Infant feeding and the mother's return to work

In the UK, the proportion of women in employment has increased considerably in recent years and about 50 per cent of women with pre-school children are in paid work outside the home. Working mothers often return to work early after having a baby and can have difficulty maintaining breastfeeding if not supported by their employers. This may discourage working mothers from breastfeeding at all. Strategies to support working mothers to continue with breastfeeding are needed. There is a clear need to re-examine the extension of statutory maternity leave and to improve the availability and quality of childcare close to the mother's workplace. The Health and Safety Executive has issued guidance for prospective parents, setting out their rights in relation to breastfeeding on return to work⁴³ and this is supplemented by a DH information leaflet directed at both

employees and employers that provides practical information on topics such as expression and milk storage.⁴⁴

Recommendation 20 of NICE Public Health Guidance 11, highlighted the need for continued support for breastfeeding in pre-school settings and accompanied this with guidance on the safe storage of expressed breast milk (Recommendation 12).⁴⁵ The School Food Trust, in its 2010 report to the DfE, *Laying the table*, also stressed the need to ensure that pre-school settings support the implementation of the DH infant feeding guidance.⁴⁶

4.5 Support for parents of young children in low-income families

National programmes introduced within the UK to address inequalities in the health of young women and children may have an important impact on nutrition. The Healthy Start scheme was introduced in 2005, following a review of the Welfare Food Scheme (WFS) in 2000 by the Committee on Medical Aspects of Food and Nutrition Policy (COMA). The review recommended that pregnant women should be given vouchers for a wide range of foods and identified the need for health professionals to give general dietary advice during pregnancy, emphasising the importance of breastfeeding. The aim of Healthy Start is to reduce inequalities in nutrition for women and children. The scheme provides food support, professional advice and support to pregnant women and mothers of young babies and children from disadvantaged backgrounds. Unlike the WFS before it, the vouchers can be exchanged for fresh or frozen fruit and vegetables in addition to milk and infant formula. Beneficiaries are also entitled to Healthy Start vitamin supplements for mother and child until the age of four years. Early evaluation of the scheme in Devon and Cornwall suggested that women who were recipients of Healthy Start were buying more fruit and vegetables than they were before the scheme began.⁴⁷ Further follow-up will be needed to confirm whether these beneficial effects on fruit and vegetable uptake are observed on a wider scale and maintained in the longer term. The evaluation did not examine overall uptake of the scheme, nor were any nutritional outcomes measured. A survey of health professionals was also carried out: interviews with a small sample of health visitors and midwives suggested that most professionals interviewed were aware of the scheme and how to apply for it. Knowledge about some elements of the scheme remained low, however, and the authors of the evaluation concluded that coverage of training to prepare for Healthy Start had been somewhat patchy. Evaluation at national level is needed to assess uptake of the scheme and to examine its impact on the nutrition of women and young children. Other public health programmes that are directed at families with young children including Sure Start and Children's Centres, also have the potential to bring about improvements in maternal nutrition and infant feeding practices. See **Chapter 3** for a more detailed discussion on the impact of Sure Start and Children's Centres.

Alongside these changes, new vitamin preparations suitable for mothers (pregnant or breastfeeding) and children were also introduced. These should be available free of charge to families eligible for vouchers under the Scheme. Recommendation 3, one of five key priorities of NICE Public Health Guidance 11,²⁹ specifically pointed out the important role these have, particularly in the prevention of vitamin D deficiency, further encouraging ready availability through community pharmacies. The NICE guidance also suggested that they should be made available through pharmacies for purchase by families not eligible for Healthy Start benefits. Unfortunately there have been numerous problems with the production and distribution of these supplements, which have compromised their potential contribution to public health.

Growing up in Britain pointed out the need to ensure that 'nutritional education is combined with practical advice... accompanied by quasi-cash incentives to purchase healthier foods'. The reformulation of the WFS as 'Healthy Start' could achieve this objective, and an evaluation is in progress. This should resolve current uncertainties about uptake and use of vouchers, implementation of related NICE guidance and the distribution of Healthy Start vitamin supplements. Additional information should be provided through the ongoing Diet and Nutrition Survey of Infants and Young Children (four to 18-months of age), which commenced in 2010.

4.6 Nutritional status of young children aged one to five years

The National Diet and Nutrition Surveys (NDNS) historically have been the major indicators of population nutritional status in the UK. The last survey relating to children from 1½ to 4½ years of age was published in 1995 and related to data collected in 1992/3, almost 20 years ago.⁴⁸ *Growing up in Britain* drew attention to a number of adverse indicators, including the high percentage of food energy derived from fat (particularly saturated fat), high intakes of sodium and non-milk extrinsic sugars, coupled with low intakes of iron, fruit and vegetables, starches and non-starch polysaccharides (NSP). The BMA's 2005 report *Preventing childhood obesity* highlighted the impact childhood obesity can have on children's current and future health.⁴⁹

More recent national data are few but early results from the NDNS rolling programme show some encouraging trends over the last 15 years.⁵⁰ Although the sample studied is small (at this early stage of the rolling programme), toddlers showed increased mean intakes of iron and zinc (probably attributable to increased consumption of meat), and increased consumption of fruit, vegetables and NSPs. The use of whole milk continued to dominate over skimmed milk but the proportion of energy derived from fat also declined slightly. The consumption of oily fish remained very low in this group (<10%) but 9 per cent of toddlers were consuming a fish oil supplement. Overall, 19 per cent of toddlers were consuming a dietary supplement in some form. Further NDNS data are

awaited, as are data from the ongoing NDNS of Young Children (4 months to 18 months of age), who had not been surveyed for many years.

Obesity

The rapid increase in the number of obese people in the UK represents a major public health challenge that requires urgent action. Obesity is among the leading health indicators that most influence morbidity and mortality in the UK. It is strongly associated with multiple chronic conditions, including heart disease, high blood pressure, arthritis, diabetes and some cancers (eg breast and prostate).⁵¹⁻⁵⁴ It is also commonly associated with indigestion, gallstones, sleep apnoea, stress, anxiety and depression.⁵⁴ Addressing this key public health concern requires a comprehensive, cross-government strategy that promotes individual behaviour change across society as a whole, and seeks to remove or mitigate unhealthy and unhelpful influences on behaviour. Central to this are policies that will create an environment that supports and sustains healthy eating and physical activity. A coordinated approach is required to increase the popularity, understanding and acceptance of such policies among the general public. Parental obesity, high birth weight, formula feeding and rapid weight gain during infancy are strong early life indicators of risk for later obesity.

In the last decade, a number of population-wide policy measures have been directed at reducing the prevalence of obesity but they have not gone far enough. In addition to those measures, incorporated in the 2011 obesity strategy there is a need to recognise that a range of interventions to support and promote behaviour change are required. Personal responsibility and 'nudge' need to be reinforced with regulatory approaches that help people make healthy choices. Such an approach is supported by the Nuffield Council on Bioethics 'ladder of interventions', which assesses whether a public health policy is proportionate and justifiable.⁵⁵ This position is also supported by the BMA's 2012 paper *Behaviour change, public health and the role of the state – BMA Position Statement*.⁵⁶ It also reflects the conclusions of the 2011 House of Lords Science and Technology Committee inquiry into behaviour change, which found that non-regulatory measures used in isolation, including 'nudges', are unlikely to be effective.⁵⁷

The significant negative influence business has on the development of effective, evidence-based strategies to tackle the obesity crisis is extremely concerning. This is evident with the Government's responsibility deal on food.⁵⁸ At its heart is a fundamental conflict of interest. While the food industry has a role to play, this should be when a strategy is in place and regulations are being implemented. It is essential that Government moves away from partnership with industry and looks at effective alternatives to self-regulation to ensure that there is a transparent and effective policy development process.

There has been an alarming rise in the levels of obesity among children in the UK and, as highlighted in the 2005 BMA Board of Science report *Preventing childhood obesity*,⁴⁹ more recent predictions anticipate this trend will continue.⁵⁹ Advertising and marketing are key factors which can affect dietary choices and attitudes to food, particularly among young people.⁶⁰ Existing safeguards included in the Audiovisual Media Services (AVMS) Directive, which prohibit product placement in children's programmes, are ineffective. According to Ofcom figures, 71 per cent of children's viewing is outside dedicated children's programming.⁶¹ Research by Which? in 2008 found that 16 of the 20 programmes on the commercial television channels most popular with children were not covered by Ofcom's regulations to protect children from unhealthy food marketing.⁶²

The DH's Change4Life campaign, introduced in 2009, is described as the marketing component of the Government's response to the rise in obesity.⁶³ The campaign aims to inspire a societal movement in which everyone who has an interest in preventing obesity, including government, business, healthcare professionals, charities, schools, families or individuals, can play their part. The campaign has been found to increase awareness among mothers regarding the need to improve their children's dietary habits.

The National Child Measurement Programme (NCMP) is an important element of the Government's work programme on childhood obesity, and is operated jointly by the DH and the DfE. The NCMP was established in 2006. Every year, as part of the NCMP, children in Reception (aged four to five years) and Year Six (aged 10 to 11 years) are weighed and measured during the school year, to inform local planning and delivery of services for children, and to gather population-level surveillance data to allow analysis of trends in growth patterns and obesity. The NCMP also helps to increase public and professional understanding of weight issues in children and is a useful vehicle for engaging with children and families about healthy lifestyles and weight issues. To encourage engagement, parents can request their child's results from their primary care trusts (PCTs). Results from the 2010/11 school year report show that in Reception, over one-fifth (22.6%) of the children measured were either overweight^a or obese. In Year Six, this rate was one-third (33.4%).⁶⁴

There is an apparent paradox in the high prevalence of obesity among young children and a reported mean energy intake below the estimated average requirement (EAR).⁴⁸ This may possibly be explained by two factors. Firstly, under-reporting of energy intake is an acknowledged feature of all dietary surveys. Secondly, the EAR for young children was in the past derived by factorial estimation. More recent data derived using doubly-labelled water methodology have shown that the factorial method overestimated the

a For population surveillance purposes, overweight is defined as a body mass index (BMI) exceeding the eighty-fifth percentile of the UK1990 BMI Reference. Obesity is defined by a BMI exceeding the 91st centile. These definitions differ from those used clinically, which apply to the ninety-first and ninety-eighth centiles respectively. 'Underweight' signifies a BMI < second centile on the same reference.

true energy requirements of this age group. The EAR for young children has accordingly been revised downwards by some 20 per cent from that previously set by COMA.^{65,66}

Very few interventions specifically directed at reducing the prevalence of obesity among children aged under five years have been evaluated systematically,⁶⁷ though there have been several public health initiatives in the UK. Some have already been mentioned in this chapter, including promotion and support of breastfeeding (particularly encouraging exclusive breastfeeding), the postponement of solid foods from the early months of life, and the adoption of a growth standard for the very young (0 to four years) based on the weight gain of breastfed infants first offered complementary foods at a mean age of 5.4 months.

Further initiatives have included education and training in the prevention of obesity for those working with young children (Healthy Exercise and Nutrition in the Really Young [HENRY]) and marketing of healthy eating and exercise to parents through the 'Start for Life' Initiative (which was suspended in 2010). The 2006 NICE guidance on prevention and treatment of obesity,⁶⁸ also made specific reference to steps which may be helpful in the prevention of obesity in the very young. These were principally that childcare settings should minimise sedentary activities during play time, and 'provide regular opportunities for enjoyable active play and structured physical activity sessions', and that they should 'implement Department for Education and Skills, Food Standards Agency and Caroline Walker Trust guidance on food procurement and healthy catering'.

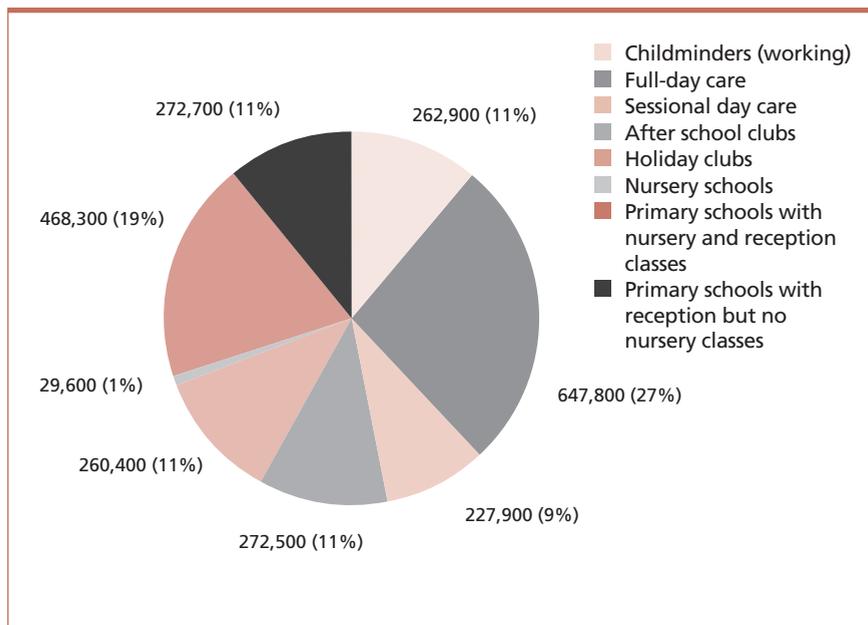
Early years settings: opportunities to encourage 'eating well'

A very large number of young British children attend formal day care placements. A 2009 survey of organised childcare found that 2,442,100 childcare places were offered by over 100,000 providers.⁶⁹ In 2009, nearly three million children were attending childcare and early years settings. The majority of places in full and sessional day care are taken up by children under five years of age (97% and 98% respectively).⁶⁹ Since September 2010, all three and four year olds have been entitled to 15 hours of nursery education each week. By 2014/15 this should be extended to every disadvantaged two year old – approximately a six-fold increase in current provision. A 2006 pilot evaluated the effect on the most disadvantaged two year olds of free entitlement between 10 and 15 hours of childcare. The pilot showed that 90 per cent of disadvantaged families took up their whole entitlement to such free placements.⁷⁰ These observations suggest that early years settings constitute an environment in which children and families could be engaged very effectively in learning about healthy eating and so set lifelong habits.

It is important in realising these opportunities to recognise the huge diversity in the nature of provision. It ranges from childminders caring for small numbers of children in their own homes, through voluntary provision in church or village halls, to formal and

permanent provision by commercially or state-funded providers (see **Figure 4.3**). This diversity presents challenges to the education and training of the workforce, to procurement and to provision of food which meets consistent, adequate and healthy nutritional standards. In order to inform its recent revision of the Early Years Strategy, the DfE commissioned the School Food Trust to report on these issues and provide practical recommendations to the review of Early Years Strategy conducted by Dame Clare Tickell.⁷¹ This task was accomplished by the Advisory Panel on Food and Nutrition in Early Years which set out eleven recommendations in its report *Laying the Table*.⁴⁶ *Laying the Table* highlighted the continuing need to provide adequate amounts of healthy and nutritious food in early years settings. The report recommended that all early years settings integrate the aims of achieving healthy eating and learning through food by applying or adapting their policies and practice on health, wellbeing and education. This approach should involve parents and children. In order to achieve these objectives it is important that food and drink provision remains a statutory component of the DfE's Early Years Strategy.

Figure 4.3: Number of early learning and childcare places by type of provider, 2009



Source: School Food Trust (2011) *Advisory panel on food and nutrition in early years. Laying the table. Recommendations for national food and nutrition guidance for early years settings in England*. London: School Food Trust. Reproduced with the permission of the School Food Trust.

An important practical issue historically, highlighted in *Growing up in Britain*, and demonstrated in national⁷² and local studies, has been the variability in the suitability of food served to young children. *Laying the table* set out clear practical food-based guidance within a nutrient framework that would enable an improvement in standards. The report demonstrated how carers with little training in nutrition could assemble attractive and palatable daily menus for young children that meet their nutritional requirements.

This task built on work previously completed by the Caroline Walker Trust^{73,74} and has since been supported by further practical materials developed by the Trust,^{75,76} which incorporate menus and photographic illustrations of appropriately sized portions. It was suggested that these materials should be made as widely available as possible, particularly to parents. *Laying the table* also pointed out the need to support better the early years workforce by enabling training, particularly in the area of diet and nutrition. It called for all local authorities to have access to a suitably qualified professional who can, if required, offer advice on interpreting the guidance within the context of individual settings. This should be a registered public health nutritionist or dietitian who has experience of working within the sector. This harmonises with Tickell's finding that: 'Repeatedly people reinforced the importance of an experienced, well-trained and supported workforce, and the international evidence supports this. Indeed, there is strong evidence that under-qualified and under-supported staff have a detrimental impact on outcomes for children'.⁷¹ This theme was also stressed by the Marmot review in 2010.⁷⁷

4.7 Micronutrient deficiency

In the 1995 NDNS, the intake of most micronutrients was satisfactory but significant exceptions were vitamin A, vitamin D (a Reference Nutrient Intake (RNI) is set for children aged three years or younger), iron and zinc. In keeping with these observations there was clear biochemical evidence of low vitamin D and iron status.

Vitamin D deficiency

The exact population prevalence of vitamin D deficiency globally is debated because there is a current lack of agreement between authorities over the biochemical definition of 'deficiency'. The most widely adopted biochemical indicator of status is serum 25-OH vitamin D concentration and within the UK a level of <25nmol/l (or <10ng/ml) is by consensus regarded as the threshold indicating risk of deficiency. Increasingly, levels between 25 and 50nmol/l are regarded as indicating 'insufficiency', as levels may drop to below the 'deficiency' threshold within the winter months when ultraviolet-B (UVB) irradiation through sunlight (required for skin synthesis of vitamin D) is absent.

In the NDNS, the proportion of young children (under six) with serum 25-OHD level <25nmol/l was relatively low (approximately 2%) though about 10 per cent showed levels <40nmol/l. This low population prevalence however belies a much higher

prevalence among ethnic minorities.⁷⁸ In recent years, there have been numerous reports that the number of young children in the UK presenting with rickets is rising. Although these have been principally case series and not based on population data, there has been increasing concern among professionals. These have been recognised in a number of documents, most recently a position statement of the SACN,⁷⁹ which reiterated the importance of ensuring that all pregnant and breastfeeding women are advised to consume a daily supplement of 10µg (400IU) vitamin D. This has been long-standing policy in the UK, as has the advice that breastfed infants over the age of six months receive a daily supplement of vitamin D that is continued through the early years of childhood. Where the mother's status in pregnancy is uncertain (for example because she did not consume a daily supplement), or where the infant is from a high-risk population group, supplements should be started from birth. Infants who are receiving formula as their main drink during the second half of infancy should not require a supplement, as infant formula (and follow-on formula) is fortified with vitamin D. A daily supplement should be taken when the infant progresses to liquid cow's milk, at about one year of age.

Despite promulgation of this advice in several policy documents, including the COMA review of the WFS⁸⁰ and the NICE public health guidance on maternal and child nutrition,⁴⁵ uptake has been poor. There have been a number of barriers which include poor professional understanding and knowledge of policy, lack of public awareness, and limited availability of suitable, low-cost vitamin D supplements. In its review of the WFS, COMA recommended that the entitlement to free vitamin supplements should be broadened beyond low-income groups and extended to groups showing high prevalence of deficiency, regardless of family income. This was not implemented in Healthy Start. The NICE maternal and child nutrition guidance (Recommendation 3) also set out a number of steps intended to improve compliance, including the suggestion that the low-cost 'Healthy Start' supplements for infants, children and women should be made available through community pharmacies. Despite this, low availability has been a key issue. At the root of this problem have been interruptions in manufacture and low profit margins, which have made the sale unattractive to retail pharmacists.

In 2011, the SACN embarked on an extensive review of the vitamin D status of the British population. This will explore some key areas including the biochemical characterisation of deficiency in the population, relationships between sunlight exposure, vitamin D intake and status, and the potential role of strategies such as fortification of foods in increasing population intake.

Iron deficiency

The 2010 SACN report *Iron and health*,⁸¹ highlighted the relatively high prevalence of iron deficiency (6%, based on serum ferritin) among children aged 1½ to 2½ years, based on data from the NDNS. Further analysis of the NDNS data revealed the greatest

prevalence of iron deficiency anaemia (haemoglobin <110g/l and/or serum ferritin <10µg/l) is found in children from low-income households, and from those in which the head of household is unemployed or receiving benefits. Children of mothers with low educational attainment or those who were not breastfed were at increased risk of iron deficiency anaemia. The dietary factors most strongly correlated with iron deficiency were high intake of cow's milk and milk products, and low intakes of meat, fruit and vegetables.⁸² Children from ethnic minority groups, particularly those of South Asian origin, are at greater risk than white British children.

Iron deficiency in young children is of particular concern because it is associated with delay in cognitive or language development. The long-term consequences of this association are, however, unclear and confounding by sociodemographic factors makes attribution of causality unwise. There is no clear relationship between elemental iron intake and iron status in this age group but iron deficiency generally marks a diet that is unbalanced and low in quality, limited in haem iron, fruit and vegetable content but high in milk and milk products. Where milk intake is high, the replacement of some by fresh fruit and vegetables, as envisaged through implementation of Healthy Start would be expected to have a desirable impact on the prevalence of deficiency. There are some signs of progress towards achieving this aim in that the most recent NDNS findings (2008/09 rolling programme; see above) indicate that meat, fruit and vegetable intakes (and so iron and zinc intakes) have increased in this age group.

Iodine deficiency

Iodine deficiency is the primary cause of preventable mental retardation and brain damage, having the most devastating impact on the brain of the developing fetus and young children in the first few years of life.⁸³ Iodine deficiency also increases the chance of infant mortality, miscarriage and stillbirth.⁸⁴ Pregnant women, lactating women, women of reproductive age, and children younger than three years of age are considered the most important groups in which to diagnose and treat iodine deficiency because iodine deficiency occurring during fetal and neonatal growth and development leads to irreversible damage of the brain and central nervous system and, consequently, to irreversible cognitive impairment.^{85,86}

The International Council for Control of Iodine Deficiency Disorders reported in August 2011 that a national study in the UK showed that more than two-thirds of schoolgirls, aged 14 to 15 years, in the UK have low iodine intakes.⁸⁷ The authors of the paper concluded there is '...an urgent need for a comprehensive investigation of UK iodine status and implementation of evidence-based recommendations for iodine supplementation'. Analysis of the NDNS dietary data for the SACN showed that intakes of most of the UK population, including children under 10 years of age, are acceptable but almost one in five girls aged 11 to 18 have an intake below the LRNI. This is associated with a strikingly lower milk intake among this population group, cow's milk

being the principal contributor of iodine in the UK diet.⁸⁸ The UK is now in the top 10 iodine-deficient countries (based on national median urinary iodine concentration (UIC)<100µg/l in children) with the greatest numbers of school-age children with insufficient iodine intake (UIC<100µg/l).⁸⁹

4.8 Teeth and fluoridation of water

Dental caries (tooth decay) is a major oral health problem in most industrialised countries, with children an especially vulnerable group. The WHO *World oral health report* (2003) reported that dental caries affected 60 to 90 per cent of school children and the vast majority of adults worldwide.⁹⁰

The prevalence of poor dental health has well-defined links to socioeconomic factors and geographical location. While the average caries incidence may have fallen, dental health inequalities are widening, with tooth decay continuing to represent a significant public health threat in socially deprived areas. Children in non-fluoridated underprivileged areas of the UK are more likely to experience decayed, missing or filled teeth (DMFT) than those in either affluent, or similar, but fluoridated areas.⁹¹

Fluoride is naturally present in all water supplies at varying levels of concentration. Its potential for benefiting oral health was first identified in the 1930s, and it is now used widely in toothpastes and mouth rinses to help prevent dental caries. Many authorities worldwide artificially fluoridate their water supplies, to either improve the oral health of the population as a whole or specifically target deprived areas to help combat inequality in dental health.

The BMA's 2009 briefing paper on fluoridation of water, concluded that it is a cost-effective public health strategy for reducing tooth decay in a population. Fluoride has been found to be highly protective against dental caries, and there is no convincing evidence of any adverse risk to human health by the introduction of water fluoridation.⁹²⁻⁹⁸ Through targeting of areas with a high prevalence of tooth decay, artificial water fluoridation is an effective strategy for reducing dental health inequalities.

4.9 Recommendations

Early infant feeding

The number of women initiating breastfeeding has increased substantially since 1999. Little or no impact has been made on the proportion of women who discontinue in the early weeks. This demonstrates that parents' choice is not adequately supported by the healthcare system and also illustrates substantial inequalities in the accessibility of support services.

- There is a need to invest in practical help from trained supporters – health professional or from the mother’s peer group. The importance of this has been highlighted in several position statements and policy documents but implementation is still very poor.
- Investment in UNICEF ‘Baby Friendly’ accreditation of acute Trusts and community providers needs to be maintained in order to ensure that the recent progress made, in increasing breastfeeding initiation, is not lost. Such investment is likely to prove cost-effective within a short time scale.³⁰
- There is a clear need to re-examine the extension of statutory maternity leave and to improve the availability and quality of childcare close to the mother’s workplace.
- Thirty years after the publication of the International Code on Marketing of Breastmilk Substitutes, there remain gaps in the legal framework controlling the marketing and promotion of breast milk substitutes in the UK. The attachment of health claims to products such as infant formula and follow-on formula may exploit these and there is a need to monitor the impact of this development.

Later infant and young child feeding

- The promotion, protection and support of breastfeeding, coupled with appropriately paced diversification of the diet to encourage acceptance of a wide range of healthy foods, is fundamental to the prevention of obesity in later life.
- The foods that parents introduce to their children reflect their own dietary preferences and lifestyle, implying that changing behaviour necessitates engagement with whole families rather than merely offering advice on children’s diets.
- This means engaging with families in a range of environments including retail outlets, early year’s settings, children’s centres and Sure Starts.
- Promotion of activity and identification of safe play space is also an important objective.

Generic issues

Lack of policy awareness among professionals and carers is a recurring theme in infant and young child nutrition.

- There is a need to ensure that the workforce has more access to specialised and contextualised advice, and that it can access suitable training.
- Competencies at an appropriate level related to infant and young child nutrition should be clearly defined core components of training for all professionals who care for young children and work with their parents.

Access to services may lie at the root of many inequalities in infant and young child nutrition. While the introduction of Healthy Start promised to engage health professionals with parents from the earliest stage of pregnancy, it is unclear whether this strategy has proved effective in improving parents’ dietary and infant feeding practices.

- Uptake of the scheme, use of the vouchers and availability and consumption of the vitamin supplements need to be monitored and reviewed.

- The financial value of the benefits offered under the scheme requires review and this will become a more pressing issue as the cost of food increases in coming years.
- Diversifying the number, and improving the quality of 'drop-in' services available through Sure Start and Children's Centres may also improve access to services capable of fulfilling the range of functions required to support breastfeeding, complementary and young child feeding.

Appendix 5 summarises some of the key nutritional concerns and recommendations from *Growing up in Britain*; it sets against each, the steps that have been taken and those that still need to be addressed.

4.10 Conclusions

Since the publication of *Growing up in Britain*, a number of policy initiatives have been implemented and there is some evidence of improvement in the nutritional health of young children in the UK. In particular, UNICEF BFI accreditation and progress towards implementation of NICE Public Health Guidance recommendations has been associated with striking increases in the proportion of women initiating breastfeeding. The greatest increases have been seen where incidence has historically been low. There is also evidence of an increase in breastfeeding initiation among lower socioeconomic groups. It is important that these efforts continue to be supported.

Disappointingly, this progress with initiation of breastfeeding has not been matched by a reduction in the proportion of women who discontinue breastfeeding in the early weeks of the baby's life. This remains unacceptably high (approximately 40% of those who start). Local health providers need to address this as a matter of urgency, by implementing recommendations from the NICE Public Health Guidance 11 and ensuring that the soluble and preventable problems causing women to stop early are more effectively addressed. The NICE Public Health Guidance 11 calls for the proactive delivery of trained breastfeeding support in the early days and weeks of the baby's life.

When women choose not to breastfeed, or discontinue breastfeeding, it is important they have access to independent advice about the appropriate use of breast milk substitutes. This should come from a suitably trained health professional and be free of commercial conflict of interest. Regulation of the manufacture, promotion, distribution and supply of breast milk substitutes should continue to be governed by European and UK legislation, which requires review to ensure that the principles of the International Code are upheld in the interests of infant health.

Implementation of the Healthy Start scheme has provided opportunities for health professionals to engage more closely with parents, advising on healthy diets for both themselves and their children. The impact of the scheme, however, is currently under review. More training of health professionals in nutrition may be needed to maximise

the opportunities that the scheme provides. It is evident that the distribution of vitamin supplements within the scheme is patchy and nationally inadequate. This has a cost in the high current prevalence of vitamin D deficiency and rickets among infants and young children, particularly in black and ethnic minority groups.

Rapid weight gain in infancy and early childhood are antecedents of obesity in later childhood. The introduction of the UK-WHO 0 to four growth standard has been an important step in aiding the recognition of a healthy pattern of early growth. There remains a need to improve the quality of food provided for young children in day care settings attended by the majority of under-fives. The introduction of practical guidance by the School Food Trust is an important development in this context. This may, however, require a review to accommodate reappraised guidance on the energy requirements of young children published in 2012.