

Executive summary

Supplementary evidence review on the effectiveness of public health interventions to improve the nutrition of infants/ children aged 6 months to 5 years

This review was carried out in July 2006 – September 2006 by the National Collaborating Centre for Women’s and Children’s Health

Background

This executive summary should be read in conjunction with the following evidence synopses:

1. The effectiveness of public health interventions to improve the nutrition of young children aged 6-24 months
2. The effectiveness of public health interventions to improve the nutrition of 2-5 years old children

This evidence review was undertaken to accompany the above reviews and to provide supplementary corroborative evidence on the effectiveness of interventions to improve the nutrition of infants/ children aged 6 months to 5 years.

Corroborative evidence relates to the process and the context of interventions, such as the components: development, content, structure, setting, mode of delivery, acceptability, characteristics of the intervener and recipient, and any unintended harmful effects. Essentially, corroborative evidence is collected to answer the following research sub questions within an evidence review:

- How does the structure and content of the intervention influence effectiveness?
- Does effectiveness vary by gender, age, ethnicity, religious practices or social/professional group of those receiving or delivering the intervention?
- Does effectiveness vary with site/setting or intensity/ duration of an intervention?
- What are the views of those receiving and delivering the intervention?
- Is there evidence of unintended or harmful effects?
- Are there barriers to replication of effective interventions?

Research questions

This evidence review aimed to gather corroborative evidence to answer the research questions outlined below.

- What interventions effectively promote the timely introduction of appropriate supplementary feeds/solids, and/or family foods?
- What interventions effectively promote uptake of recommended vitamin and micronutrient supplements?

- What dietary strategies effectively reduce the risk of food allergies and intolerance?
- What dietary interventions effectively prevent diet-related dental caries, tooth loss and dental erosion in infants and young children?
- What interventions effectively help mothers continue breastfeeding after 6 months, both at home and out of home? (e.g. to return to paid employment)
- What is the effectiveness of public health interventions delivered at home, in nurseries, playschools, crèches and other pre-school settings that aim to promote healthy eating (i.e. increasing fruit and vegetable intake, reducing excess salt intake, and reducing the intake of artificially sweetened soft drinks and chocolates/sweets) in pre-school children?
- What interventions effectively promote the uptake of recommended vitamin and micronutrient supplements?
- What is the effectiveness of dietary strategies that aim to reduce the risk of food allergies and intolerance, and the effectiveness of interventions that promote this advice?
- What is the effectiveness of interventions that aim to prevent diet-related dental caries in pre-school children?
- What is the effectiveness of dietary strategies that aim to increase the intake of iron rich foods and reducing the rate of iron deficiency anaemia among pre-school children?

Methods

A non-systematic review was conducted. Studies of corroborative evidence i.e. surveys, qualitative studies, cohort studies, case-control studies, case-series, expert opinions etc were identified via:

- a systematic search of bibliographic databases Medline, Embase, Cinahl, CCTR, CDSR, DARE and AMED from 1966 to 2006
- a snowball search of the internet i.e. websites such as Department of Health, Health Education Authority, MAFF, FCA, DEFRA, WHO and UNICEF
- a hand /document search from reference studies
- literature search of the grey literature.

Results

Interventions on nutrient supplementation

Iron

Two 1+ RCTs conducted in two populations, Honduras and Sweden, (Domellof et al. 2001; Dewey et al. 2002;) was identified which assessed the effects of iron supplements in breastfed infants aged 4 months. The data from the Swedish RCT are presented. Healthy infants from aged 4 months, exclusively breastfed and whose mothers intended to breastfeed till at least 9 months were randomised to receive iron supplements (1mg /kg/day) from 4-9 months or placebo 4-6 months and iron from 6-9 months or placebo 6-9 months. There was a low prevalence of iron deficiency anaemia in the Swedish infants studied (< 3%). The results showed that breastfed infants with normal iron status given iron supplementation (1mg /kg/day) have lower length gain than infants given placebo at 9 months. Weight gains were similar between the supplemented group and the placebo group. Diarrhoea was more

prevalent in the supplemented group than the placebo group. The two studies suggest that routine iron supplementation of breastfed infants may benefit those with poor iron status (low haemoglobin) but may present risks for those with normal iron status (normal haemoglobin).

A 2+ controlled trial by Griffiths et al. 1995 aimed to improve intakes of iron-rich foods and vitamin C to prevent anaemia. Participants were 6-12 month old infants of mainly Asian families of low socio-economic status, from general practices in Bolton, UK. The study found that there was no significant difference in the iron and anaemia status of Asian infants aged 6 to 12 months whose parents received health promotion when compared with parents who received standard care, at 12 months.

A 2+ cohort study (Smith et al. 1986) which tested the efficacy of individual nutrition counselling of WIC children (The Special Supplemental Nutrition Program for Women, Infants, and Children) (aged below 5 years) along with 30 minute nutrition education classes and WIC vouchers found that the haemoglobin concentration of young children improved in the intervention group and was higher than the control group after 6 months ($p < 0.05$).

Evidence statement 1

Evidence from two 1+ RCTs suggest that routine iron supplementation of breastfed infants may benefit those with poor iron status (low haemoglobin) but may present risks for those with normal iron status (normal haemoglobin).

Evidence statement 2

There is evidence (2+) to suggest that there is no significant difference in the iron and anaemia status of Asian infants aged 6 to 12 months whose parents received health promotion, compared with parents who received standard care, at 12 months.

Evidence statement 3

A 2+ study found that anaemic children aged 5 years whose parents received individual counselling, group nutrition education and WIC food vouchers achieved a higher mean haemoglobin levels when compared with children whose parents who did not receive the intervention, at 6 months follow-up.

Iron fortified follow-on milks

A 1+ UK RCT (Daly et al. 1996; Williams et al. 1999) compared the haematological and dietary effects of a follow-on iron-supplemented formula milk (12 mg iron/l) with unmodified cows' milk (0.5 mg/l) in a group of inner city toddlers who were already receiving pasteurised cows' milk by 6 months of age. The study reported a significantly higher occurrence of anaemia (haemoglobin concentration < 110 g/l) in the cows' milk group than the follow-on formula group (31% vs. 3%, $p < 0.007$) at 12 months. At 18 months of age, the follow-on formula group returned to cows' milk and both groups were followed up until 24 months. There was a significantly higher occurrence of anaemia in the cows' milk group than the follow-on formula (33% vs. 2% at 18 months, $p < 0.0001$ and 26% vs. 0% at 24 months, $p < 0.002$, respectively). This study suggests that the provision of a follow-on formula in place of pasteurised cows' milk between 7.8 and 18 months of age was effective in preventing anaemia.

Developmental assessments of the children showed that by 24 months, there was a significant decline in the mean Griffiths general quotient scores in the unmodified cow's milk when compared with the iron-supplemented formula milk group (14.7 vs. 9.3, 95% CI 0.4 to 10.4). Replacing unmodified cow's milk with an iron-supplemented formula milk up to 18 months of age in infants from inner city areas may prevent iron deficiency anaemia and reduce the decline in psychomotor development in the second year. There was no effect on growth parameters.

Evidence statement 4

Findings from a 1+ RCT suggest that follow-on iron-supplemented formula (12 mg iron/l) given between 7 to 18 months improves iron status and reduces the decline in psychomotor development of infants from an inner city area when compared with infants given pasteurised cows' milk (0.5 mg/l). There was no effect on growth parameters.

Zinc

A US double-blind 1+ RCT (Heinig et al. 2006a) compared the effects of zinc supplementation with placebo in breastfed infants. The study reported significantly higher plasma zinc concentrations in the supplemented group when compared with the placebo group, however there was no significant difference in mean weight and height attainment between zinc-supplemented infants and placebo and no significant differences in dietary intake, illnesses and gross motor development at 10 months.

Evidence statement 5

Evidence from a 1+ RCT suggests that zinc supplements of 5mg daily for 6 months did not have any significant effects on growth, development and risk of infections in breastfed infants when compared with infants given placebo.

Carers' beliefs and attitudes on early weaning

Five UK qualitative studies/ surveys (evidence level 3) were found which investigated carers' belief and attitudes on early weaning (Alder et al. 2004; Anderson et al. 2001; Wright et al. 2004; Daly et al. 1998; Condon et al. 2003). The studies explored cultural and social norms and attitudes around feeding and early weaning. The studies consistently found that early weaning is influenced by the mother's perceptions of the baby's needs (i.e. perceived hunger), cultural beliefs and advice, encouragement from family members and friends. Infant weight was seen as a marker of child health and successful parenting. There was a reported association between early weaning and maternal smoking, non-breastfeeding, male infants and low maternal educational level. A UK focus group study (Condon et al. 2003) of women from Bangladeshi, Pakistani, Somali and Afro-Caribbean backgrounds found some were adopting poor British weaning practices such as introducing egg custard and tinned baby foods at 4 months.

Evidence statement 6

Evidence from five UK qualitative studies/ surveys (evidence level 3) indicate that the introduction of solid foods is influenced by mother's perceptions of the baby's needs, cultural beliefs and advice/encouragement from family members and friends. The most common reasons for early introduction of

solid foods were mothers' perception that the infant was hungry and not settling. Infant weight was perceived as a marker of child health and successful parenting. There is an association between early introduction of solid foods and maternal smoking, non-breastfeeding, male infants and low maternal educational level.

Issues relating to food intake patterns of young children

As well as being a time when children are growing quickly and becoming more active, the preschool age (1-5 years) is also a time when children learn about food, which will later establish their food knowledge, and patterns of food acceptance and preferences. It has been suggested that a child's unique food preferences are influenced by learning and repeated experience via the process of associative learning and imitation, and is shaped by the social context in which the food is consumed (Birch, 1998). Three studies (two observational studies and one survey – evidence level 3) were identified which investigated these influences in young children (Birch et al, 1998; Abramovitz & Birch, 2000; Wardle et al. 2005).

A US observational study (Birch et al. 1998) examined the effects of repeated exposure to a target food in enhancing acceptance of the same food and different food among breastfed and formula-fed infants aged 4-7 months. The study found that exposure to the target food once a day for 10 days significantly increased the infant's intake of the target food. Same, similar and different food intake also increased two-fold with target food exposure.

A UK survey (Wardle et al. 2005) examined the relationship between parental control over feeding and children's fruit and vegetable intake. The participants (n=564) were parents of nursery school children aged 1-6 years. More parental control was significantly associated with less frequency of children's fruit and vegetable consumption ($p < 0.01$). Children's consumption of fruits and vegetables was positively associated with parental consumption of fruits and vegetables and negatively correlated with neophobia, suggesting that interventions aimed at increasing children's intake of fruits and vegetables would be well advised to target parents' eating habits and feeding practices.

Finally, a US study by Abramovitz & Birch (2000) explored concepts about dieting in girls aged 5 years (n=197) and their parents. Girls whose mothers reported current or recent dieting were more than twice as likely to have ideas about dieting, suggesting that mother's dieting behaviour is a source of young girls' idea, concepts and beliefs about dieting.

Evidence statement 7

The formation of children's food preferences and acceptance patterns are shaped by learning and repeated experience within the social context in which the food is consumed. Evidence from observational studies and surveys (evidence level 3) suggest that

- **Repeated exposure to a target food enhances the acceptance of same, similar and target foods in young infants.**
- **Children's consumption of fruits and vegetables was positively associated with parental consumption of fruits and vegetables.**
- **Women's own weight control attempt may influence their young daughters' emerging ideas, concepts and beliefs about dieting.**

Weaning interventions to improve feeding practices

An unpublished 1+ UK RCT (Watt et al. 2006) compared the effect of a peer support intervention on infant feeding practices. The primary outcome was vitamin C intake from fruit. Women were recruited in baby clinics in deprived areas of Camden and Islington when their infants were 10 weeks old and allocated to the peer support (n=157) or standard professional care (n=155). Local mothers offering peer support were volunteers, who received training to provide the support and monthly home visits were offered over a 9 month period. The support offered by the volunteers was designed to complement the advice provided by health professionals.

The findings from the study showed a significant increase in knowledge in infant feeding practices and confidence in following advice from health professionals in mothers receiving peer support compared with control. The intervention was much valued by the intervention group and the volunteers who provided the intervention. There was no significant difference in vitamin C intake from fruits, in growth parameters, use of NHS services and medication use among infants whose mothers received peer support and advice on infant feeding practices when compared with control 18 months after the intervention.

Evidence statement 8

Unpublished findings from a 1+ UK RCT suggest that a peer support intervention designed to improve infant feeding practices can increase feeding knowledge, confidence in following advice and was valued by recipients and volunteers providing the intervention. However the intervention did not positively influence vitamin C intake from fruits, growth parameters, use of NHS services and medication use among infants.

Weaning support and dietary education for minority ethnic groups

Two UK studies were identified which targeted minority ethnic groups (Ilett et al. 2004; Smith et al. 2004). A 2+ uncontrolled before-and-after study (Ilett et al. 2004) assessed the effects of an intensive, home-based programme of dietary education to mothers to improve the diet of toddlers of Pakistani origin, living in Bradford. These children were found to have haemoglobin of 8.0 -10.9 g/dl at 13 months check-up and were offered iron therapy. Their mothers were offered dietary education, delivered in 6 one-hour visits over 12 weeks, by a native-speaking link worker who was supervised by a health visitor.

The study reported improved maternal knowledge of anaemia, increased frequency of iron and vitamin C rich foods consumption and feeding practices such as use of cups and finger foods, and reduction in cow's milk consumption and difficult eating behaviour, three months post intervention. The personalised, home-based and culturally acceptable nature of the intervention was well received and valued by the mothers caring for young children and who might not manage to leave their homes. This study suggests that mothers of Pakistani origin gained knowledge and changed their children's diet following diet health education programme. The study also demonstrated the value of a home-based programme delivered by a trained link worker to this group, which has difficulty in accessing clinic-based services.

Furthermore, an evidence level 3 observational study (Smith et al. 2004) was identified which evaluated the use of link workers in providing weaning support to

South Asian families in Luton. Support was provided to the link-workers throughout the intervention to be competent to visit clients (n=30 families of Pakistani origin with infants aged up to 3 months) in their own homes to offer appropriate weaning advice. The weaning message focused on the importance of offering infants a varied diet, on food texture, using a cup, highchair, finger foods and the social aspects of feeding.

At one year, 92% of the families given the weaning intervention reported giving their infants a varied diet, and 100% of children were using drinking cups and finger feeding. The study suggests that specially trained link-workers can be effective in helping Asian families to establish healthy weaning patterns.

Evidence statement 9

There is evidence from two UK studies (2+ and 3) to suggest that specially trained link workers can be effective in helping South Asian families to establish healthy weaning patterns, modest changes in children's diets and improved maternal knowledge.

Oral health – bottle to cup

An observational study (evidence level 3) (Andrew. 2004) evaluated a UK public health campaign (Beakers for bottles), based on the Bradford 'Bottle Amnesty' of 1994, to improve child feeding practices and oral health among the Asian populations in Huddersfield. The target populations were all families with children under 5 years old. The objectives were to address and reduce the practice of giving babies any drinks other than milk or water in a feeding bottle; to encourage parents to swap bottles for beakers when the children reached 6 months old; to raise awareness of the damage sugar can do to children's teeth and to encourage proactive and regular contact with the dental service.

The evaluation showed that 40% of the attendees were from the South Asian community with over 80% scoring the event highly. No negative comments were recorded. However no long-term outcomes such as increased use of beakers or dental caries were assessed and no follow-up evaluation of the campaign was identified. It is not clear if the discarding of feeding bottles and giving of feeding cups had any effect on the increased use of feeding cups after the campaign.

Evidence statement 10

There is UK observational study evidence (level 3) to suggest that a community based campaign to improve child feeding practices and oral health among the Asian children aged under 5 years was well received by the target populations.

Interventions relating to growth faltering (non-organic failure to thrive)

Growth faltering is a common feature of early childhood and has been associated with a range and combination of dietary and social factors such as delayed weaning, poor appetite, leading to under nutrition, and a mismatch between maternal feeding and child eating behaviours. Three 1+ RCTs were identified which investigated the effectiveness of interventions by health visitors on growth faltering (Black et al. 1995; Wright et al. 1998; Raynor et al. 1999).

A US RCT (Black et al. 1995) evaluated the efficacy of a family-focused and home-based intervention on the growth and development of children with non-organic failure to thrive. Children (mean age 12.7 months) from low income families were randomised to clinic plus home intervention or clinic only. All children received services in a multidisciplinary growth and nutrition clinic. The intervention provided maternal support and promoted parenting, child development, use of informal and formal resources and parents advocacy.

At one year follow-up, there was a significant improvement in children's weight for age, weight for height and height for age in the clinic plus home intervention. Children in the clinic plus home intervention also had better receptive language over time and more child-oriented home environments. There were no significant differences between the two groups in their changes in motor development and skills gained in interactive competence during feeding.

A UK RCT by Wright et al. (1998) assessed the effects of health visitor intervention on children (aged 7-35 months) diagnosed with failure to thrive in the first 2 years of life. The intervention involved visits by the dietician, special advice from and monitoring of weights by the specialist health visitors and when appropriate, referral to social work assessment and discussion on future management. Children in the control centres received routine care from health visitors who did not receive specialist training.

At follow-up beyond age 3 years, it was reported that children in the intervention group were significantly heavier and taller and reported to have better appetite than children in the control group. There was a significant number of children in the intervention group who had recovered from their failure to thrive, compared with the control group (76% vs. 55%, $p < 0.001$).

A smaller scale UK RCT (Raynor et al. 1999) assessed the effects of home intervention by a specialist health visitor on children with non-organic failure to thrive. Children aged 4-30 months were randomised to conventional care plus additional specialist home visiting ($n=42$) or conventional care only ($n=41$) for 12 months. The intervention consisted of intensive home visiting from a specialist health visitor who was trained in managing eating problems, assessment of parent-child interactions, counselling skills and nutrition, who could seek advice from a psychologist, dietician and paediatrician for any concerns relating to the families.

A 1 year follow-up, there were no significant differences in growth, mental and psychomotor development progress, behavioural problems and maternal mental state between the two groups. However, there were significantly fewer referrals to other professionals and admission to hospital.

Evidence statement 11

There is evidence from two 1+ RCTs that home visiting interventions provided by trained or specialist home visitors to children with non-organic failure to thrive can improve children's growth, reduce developmental delays and improve the home environment. However there is conflicting evidence from a smaller scale 1+ UK RCT who did not confer any benefits in relation to growth, developmental progress and behavioural problems.

Interventions relating to Nutrition Education Aimed at Toddlers (NEAT)

A US 2+ controlled before-and-after study (Horodynski et al. 2005) assessed the effects of the Nutrition Education Aimed at Toddlers (NEAT) program on carers of toddlers aged 1-3 years from rural low-income families. NEAT aims to improve carer-toddler mealtime interaction by empowering carers to become responsive to the child's verbal and nonverbal behaviours, enabling the child to clearly communicate hunger, fullness and eating preferences, thus developing the child's ability to self-regulate his food intake, crucial to the development of healthy life-long eating habits. The findings from the study reported that carers of toddlers from low-income families, who received the NEAT program intervention had a significant higher knowledge scores concerning toddler feeding than controls.

Evidence statement 12

Evidence from a 2+ study demonstrates the need to focus on other avenues, such as responsiveness to children's verbal and nonverbal behaviours, in addition to increasing knowledge, to enhance parents' ability to feed toddlers appropriately.

Interventions relating to Sure Start scheme

A evaluation report (evidence level 3) (Bournemouth University. 2004) was identified which evaluated the St Philips Healthy Eating Project, part of the UK national Sure Start scheme to promote the physical, intellectual and social development of young children. The St Philips Healthy Eating Project is one of the 524 individual schemes which aim to help families develop healthy eating habits and strengthening families and communities.

Multi-choice or single-choice meals were provided once a month, at the end of the Toddler Group sessions. Food was prepared fresh by volunteers and provided parents/carers and their children with a nutritious and healthy meal.

Findings from the evaluation suggest that parents' and carers' views were positive about the project, however dietary outcomes were not assessed. The project provided opportunities to eat together in a social setting where children could see what other children were eating and learn to eat with others and table manners. Families also learn about new ideas of healthy eating and trying out new recipes.

Evidence statement 13

The St Philips Healthy Eating Project, which aimed to help families to develop healthy eating habits in a community setting, was well received and appreciated (evidence level 3).

Interventions to improve nutritional adequacy in day-care centres

Four studies (three 2+ and evidence level 3 observational study) were identified which investigated interventions to improve nutritional adequacy in day-care centres (Bruening et al. 1999; Sangster et al. 1999; Pollard et al. 2001; Williams et al. 2002). Two studies were conducted in the US and two in Australia.

The CACFP is a USA federal program which reimburses child-care institutions that serves nutritious food to children in day-care centres, especially in low-income areas. Children attending day-care centres which participated in the Child and Adult Food Program (CACFP) scheme consumed more servings of nutritious meals and had less days of illness than children who consumed meals and snacks from home (Bruening et al. 1999).

The Good Food for Children (GFFC) programme in Australia (Sangster et al. 1999) involved assessment of centres' menus and developing workshops for childcare staff in day care centres. The intervention reported a significant improvement in the nutritional adequacy of food provided in child day care centres given the GFFC (GFFC) programme when compared with control day care centres

An Australian study (Pollard et al. 2001) evaluated the impact of the Start Right–Eat Right Award scheme to improve nutrition and food service standards in child care centres. The components in achieving the award included aspects of nutrition training, food service planning, safe food handling and menu planning by centre coordinators and cooks. The scheme was found to have the potential to improve nutrition and food service standards in child care centres.

Finally, Williams et al. (2002) assessed the effects of the Head Start Program on preschool menus and children's dietary intake in the USA. The Healthy Start Program was a three year preschool cardiovascular risk reduction and comprehensive health education program. It was designed to modify the preschool environment in relation to the fat content of preschool meals and snacks, involving training of the cooks in planning menu, recipe development, food purchasing and food preparation. The programme was found to be effective in reducing the fat and saturated fat content of preschool meals and reducing children's consumption of saturated fat at preschool without compromising energy intake.

Evidence statement 14

There is evidence from four studies (three 2+ and evidence level 3 observational study) to suggest that interventions in day-care centres improves the nutritional adequacy of the food provided and is associated with dietary improvements.

Effects of advertising and food promotion on children

A 1+ systematic review (Hastings et al. 2003) assessed the effects of food promotion on children's food knowledge, preferences and behaviour. The review identified seven studies which found that exposure to food promotion had an influence on, or was significantly associated with, the specific purchase-related behaviour measured in each study (for example, sales, household purchase).

Furthermore, eleven studies investigated the effects of exposure to food promotion on children's food consumption behaviour. Overall the studies provide evidence of an effect of food promotion on consumption behaviour. Effects were sometimes inconsistent and were not found in all the studies, but were found in sufficient studies to suggest that food promotion influences children's food consumption.

Studies suggest that food promotion or television viewing significantly influences children's food behaviour and diet independently of other factors known to influence

children's food behaviour and diet. However there is little evidence to show whether the influence of food promotion on children's food behaviour and diet is greater or lesser than that of other factors.

Evidence statement 15

There is 1+ systematic review level evidence to suggest that food promotion can have an effect on children's food preferences, purchase behaviour and consumption. The majority of food promotion focuses on foods high in fat, sugar and salt and therefore tends to have a negative effect. However, food promotion has the potential to influence children in a positive way, in improving their nutritional knowledge.

Conclusions

In linking the evidence statements to the making of the recommendations, caution needs to be exercised in considering the level of evidence, applicability and generalisability of this evidence to the UK population.

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