Evidence Tables 2 - 5 Years

Evidence is presented to answer the following questions:

1. 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?

2. What interventions effectively promote the uptake of recommended vitamin and micronutrient supplements?

   (No studies were identified in the literature that addressed this question).

3. 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?

4. What is the effectiveness of interventions that aim to prevent diet-related dental caries, in pre-school children?

5. 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?

1 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?

Studies to be included	Evidence type	UK studies (other than RCTs)
Systematic reviews Randomised controlled trials	<u>Systematic reviews</u> Ciliska 1999 Contento 1995 Elkan 2000 Tedstone 1998 Thomas 2003 <u>Randomised controlled trials</u> Bannon 2006 Blom-Hoffmann 2004 Cottrell 2005 Lagstrom 1997 Lumeng 2007 Wardle 2003	Corroborative evidence from two UK studies is presented in the text of the review Lowe 2004, Horne 2004 Ofsted 2006 Scottish Executive 2006

Healthy eating in pre-school children

Author, Year, Design Quality	Research Question	Study populations	Study quality	Interventions	**Main results**	Applicability to UK populations and settings Comments Funding
Ciliska 1999 SR 2+	What is the effectiveness of community interventions to increase fruit and vegetable consumption in people aged 4 years and older?	<u>Inclusion/Exclusion</u> Intervention intended to alter fruit and vegetable consumption, within scope of public health, participants 4 years and over, prospective study with comparison group, information on process or outcome evaluation. No exclusion criteria given. Del Tredici 1988 (CT) EFNEP Californian mothers n=683 (Int, n=355; Con, n=328) Cox 1996 (RCT) EFNEP Virginian mothers	<u>Quality Assessment</u> All studies assessed by 2 readers based on: selection bias, study design, confounders, blinding, data collection methods, handling of withdrawals and dropouts. Each paper given a global rating of strong, moderate or weak. Del Tredici 1988 (CT) moderate (no intervention control group/no weak ratings) Cox 1996 (RCT) moderate (weak on	2 studies were evaluations of the Expanded Food and Nutrition Education Programme (EFNEP) which includes lesson activities, food preparation demonstrations and written material, tailored to individual families. Del Tredici 1988 Intervention: EFNEP Instruction over 6 months with mean no home visits = 7.8, mean length = 80 min Instruction included: selecting and buying; cooking and preserving; and food safety No controls Cox 1996 Intervention: 18 EFNEP lessons	<u>Interventions with parents of young children</u> EFNEP studies: Intervention group families significantly increased fruit and vegetable intake at the end of a 6 month period Del-Tredici (EFNEP) – Increased fruit and veg from 2.6 to 3.7 servings/day $p<0.001$ Also increase in Vit C and Vit A rich fruits & vegetables, and variety of fruit and vegetables eaten Cox (EFNEP) - increase from 1.5 to 2.6 servings/day of fruit in Int group vs. no change in controls $p<0.002$	Most findings apply to family consumption. Such interventions may be tested in Sure-Start settings Koblinsky 1992 Workshops and letters were translated into Spanish for the New York centres. Havas (WIC) Change in intake was related to the no. of sessions attended. The Public Health Branch of the Ontario Ministry of Health

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		n=150	randomisation)	given by a paraprofessional nutritionist: 2/week for 6 months including: health futures (cancer prevention), dietary and lifestyle factors, food choices, cooking methods, ↓ fat,↑ fruit and vegetables 3 random repeat 24 h dietary recalls carried out at each session	- increase from 0.9 to 1.6 servings/day of vegetables in Int group vs 0.6 to 0.8 in controls *p*=0.04 Also increase in Vit E and fibre intake in Int vs. Con. No impact on calcium/milk intake	
		Koblinsky 1992 (Cohort) Head Start Programme mothers in New York and Maryland States n-171 (Int in 3 NY centres and 2 Maryland centres, Con in 3 centres in both states)	Koblinsky 1992 (Cohort) moderate (weak on blinding)	Koblinsky 1992 Intervention: 13 weekly nutrition newsletters and 4 workshops (2 h each, 2 weeks apart) including presentations, hands on activities, small group discussion and food demonstrations (Head Start) including: nutrition of and feeding the preschool child; meal planning and preparation; food shopping skills. Controls: usual Head Start Programme	Koblinsky (Head-Start) - No significant change in cluster 1 New York centres which had a higher baseline intake; cluster 2 Maryland centres increased - family intake of fruit from 1.9 to 2.7 servings/day p<0.05; - vit. C rich fruit intake increased from 0.3 to 0.67 servings/day p<0.05; - dark green veg intake increased from 0.27 to 0.58 servings/day p<0.05 - dark orange veg intake also increased p<0.05	
		Havas 1998 (cross-over RCT) WIC mothers (US Programme for Women, Infants and Children) n=3122 at 16 randomised sites	Havas 1998 (cross-over RCT) moderate (weak on blinding)	Havas 1998 3 group nutrition sessions led by peer educators over 3 months, and mailed printed materials. Controls: usual WIC programme (10 min of nutritional education every 2 months Follow-up for 2 years	Havas (WIC) - Increase in fruit and veg intake of 0.56 servings/day in Int gp vs. 0.13 in Con gp (both from 3.88 servings/day) p=0.002 - Also an increase in nutritional knowledge of Int gp vs. Con gp - Women who were white, <30yrs, high school graduates, not working and non-smokers showed greater increases p<0.05.	
		Graves 1982/Shannon 1982 An American cohort study examined	Graves 1982/ Shannon 1982 (cohort) moderate (no	Graves 1982/Shannon 1982 Intervention for children: a 9-week curriculum, cafeteria posters and	<u>Interventions with school children</u> Graves/Shannon - Increase in consumption of broccoli, carrots and spinach salad (p<0.05) - Increase in green bean intake (p<0.01)	

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		interventions targeting school children grades K to 6 (including under fives) Nutrition in a changing world <u>Search strategy</u> Electronic databases searched – CINAHL, Cochrane Library, Current Contents, Dissertations Abstracts, EMBASE, ERIC, Health star, MEDLINE, Public Health Effectiveness Project Database, PSYCHINFO, and Sociological Abstracts. Hand searches -15 journals. Grey literature sought from several sources. Years searched – Databases from year of existence to 1998; hand searches from 1988 to 1998. <u>Studies</u> 60 studies included in quality assessment; review focuses on 18 studies rated strong	weak ratings)	activity sheets Controls: usual health curriculum	- increased knowledge, and improved attitude to eating nutritious foods and vegetables but not to eating new foods.	

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		or moderate, of which 5 American studies were relevant to this review.				

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Contento 1995 SR 2-	To assess the effectiveness of nutrition education for the public	Inclusion criteria Research and interventions conducted in the US since 1980 were included. Studies had to be randomised or of a 'strong quasi-experimental' design. The review included studies on preschoolers, school-aged children, adults, pregnant women, caregivers of infants, older adults, paraprofessionals and professionals. Number of studies The review presents results for 217 nutrition-education intervention studies – 23 of which involved preschool children (Results of 25 studies actually described in the text) 21 studies were described as pre-post studies (only some with control groups):	Quality Assessment criteria None reported Evaluation studies included with strong evaluation designs and with random assignment to control and treatment groups or strong quasi-experimental designs with some evidence of instrument reliability and validity. Also studies with some evidence of reasonable design and measurement. Studies with limitations included if limitations were noted and had promising approaches.	Settings - nursery school, preschool, child care facilities (day care), homes, lab, cafeteria and Head Start 1. Impact of parental involvement on children's nutritional knowledge and behaviour Anliker et al Parents' messages about food and nutrition Assessment – child's nutritional knowledge Klesges 1991 Child selects own foods and mother modifies child's selection - 1 day Food selection observed 3 studies of parental involvement in the nutritional education curriculum Singleton et al 1992 8 autotutorial lessons in audiocassette book format for use at home over 4 weeks Int and Con groups Assessment – pre-test, post-test, measured children's health perceptions and food preferences Lee et al 1984 8 week concept-based programme at school or at home	1. Impact of parental involvement on children's nutritional knowledge and behaviour Anliker et al ▪ Positive nutrition messages from parents to children have a greater impact than negative messages ▪ Children's nutritional knowledge scores were significantly higher when parent's nutritional messages were more frequent and more specific Klesges 1991 ▪ Mothers have a great influence on food selection of their children (children modified food choices with the threat of parental monitoring) ▪ Children given a free choice chose a tray of foods high in sugar but when they were aware of their mother's presence they chose a tray with fewer high sugar foods. Presence of the mother decreased calorie, saturated fat and sodium intake but did not increase nutritious items. (There was no impact of obesity status of mothers or children on the results.) *Parental involvement in the nutritional education curriculum* Singleton et al 1992 ▪ Home-only education need to involve intensive activities (audio cassettes and picture books) and be based on activities parents and children can do together ▪ The audiocassette book format at home significantly increased children's perception of health and nutrition being related but only when the evaluation method involved open-ended questions Lee et al 1984 ▪ Children taught at school learn significantly better than those taught at home	All these interventions are applicable to UK settings. Funding United States Department of Agriculture

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		Birch and Marlin 1980 Nursery school n=39 Birch and Marlin 1982 Preschool n=14 Birch et al 1980 Preschool n=64 Birch et al 1984 RCT Preschool n=45 Community Research Centre 1980 Child care facilities n=168 Galst 1980 RCT Nursery school children ages 3-7y n=65 Hunsley 1982 Daycare and preschool n=850 preschoolers and parents, also 80 teachers in 17 nursery schools and childcare centres Berenbaum 1986 Davis et al 1983 Preschool, daycare centres and homes 16 centres (no controls) Lee et al 1984 RCT Lab and home n=60 Gorelick and Clark	Only 25% studies identified met criteria for inclusion	2 Int and 1 Con groups For all 3 groups n=20 Assessment – pre-test, post-test, children's food preferences Essa et al 1988 Nutrition classes at school for 10 weeks with/without parental involvement at home Int 1: parental involvement n=23 Int 2: no parental involvement n=22 Con: no special nutritional instructions n=15 Assessment – pre-test, post-test, nutritional knowledge <u>2. Effect of nutrition education on families of children in Head Start:</u> 3 studies Gunn and Stevenson 1985 Workshops, lectures, newsletters, festival and exercise activities for parents 9 months Assessment – pre-test, post-test, family eating habits and exercising with their children Koblinsky et al 1987 Special cooking friends – trained nutrition volunteers (e.g. home economists and dietitians) worked with families (no other details) Koblinsky et al 1992 Newsletters and workshops for 13 weeks Int and Con groups Assessment – pre-test, post-test, children's food intake	Essa et al 1988 ▪ Parents and teachers working together make more of an impact than either alone through mutual reinforcement ▪ Nutritional knowledge scores were significantly higher in both groups after the intervention but significantly higher with parental involvement at home <u>2. Effect of nutrition education on families of children in Head Start</u> ▪ The Head Start programme (involving education and encouragement of parents) has had a number of positive outcomes (a more diverse high quality diet, improvements in meal planning, food preparation etc) Gunn and Stevenson 1985 ▪ Various activities for parents led to a significant increase in the variety of food consumed by the family, a decreased fat intake and an increase in parents exercising with their children Koblinsky et al 1987 ▪ Trained nutrition volunteers working with parents led to improvements in meal planning, food preparation and eating habits Koblinsky et al 1992 ▪ Children whose mothers received nutritional education via newsletters and workshops had a significantly more diverse diet with higher quality and more servings of nutritious foods than those in the control group	

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		1985 RCT Preschool n=187 aged 3-5 y, 20 classrooms in 14 schools Gunn and Stevenson 1985 RCT Head Start n=95 parents Stark et al 1986 Preschool and home (children aged 3-6y) n=17 Turner and Evers 1987 RCT Preschool n=55 Essa et al 1988 RCT Daycare centre and home n=60 Hendricks 1989 RCT Preschool n=267 9 preschool programmes Lawatsch 1980 RCT Preschool n=103 Koblinsky et al 1987 Head Start Koblinsky et al 1992 RCT Head Start n=171 mothers Singleton et al 1992 RCT Home n=60 Byrd-Bredbenner et al 1993 Head Start n=1000, 65 classrooms across		<u>3. Impact of nutrition education on children where knowledge was measured</u> All 3 studies in daycare settings involved appropriate curricula, activity based including group action stories and songs and self-selected activities involving food Gorelick and Clark 1985 12 nutrition education activities including tasting foods, 2/week for 6 weeks Int and Con groups Assessment – pre-test, post-test, nutritional knowledge Turner and Evers 1987 Nutrition lesson with computer or puppets Int and Con groups Assessment – pre-test, post-test, nutritional knowledge Hendricks 1989 Hale and Hardy's Healthful Hints curriculum for 7 months Int n=194; Con n=73 Assessment – pre-test, post-test, nutritional and health knowledge <u>4. Effect of nutrition education on children where knowledge, attitudes, and behaviour were measured: 6 studies</u>	<u>3. Impact of nutrition education on children where knowledge was measured</u> ▪ All of the education programmes assessed (e.g. food-based activity, nutrition lesson with computer or puppets, Hale and Hardy's Healthful Hints curriculum) resulted in at least moderate increases in knowledge Gorelick and Clark 1985 ▪ A 6 week activity programme led to a significant improvement in food preferences and nutritional knowledge in the intervention group compared with controls, particularly in food identification and for older children in food choice Turner and Evers 1987 ▪ Nutrition lessons using computers or puppets were both equally effective at increasing nutritional knowledge Hendricks 1989 ▪ The Hale and Hardy's Healthful Hints curriculum increased children's nutritional and health knowledge <u>4. Effect of nutrition education on children where knowledge, attitudes, and behaviour were measured</u> ▪ Three studies resulted in changes in some behaviours and three resulted in no change ▪ Three of the studies also investigated nutritional knowledge for which all 3 interventions were successful ▪ Attitudes were investigated in 2 studies for which 2 of 3 attitude scales were improved in one study and there was no effect in the other study ▪ Researchers commented that there frequently was insufficient time for the intervention to have an effect	

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		the US Observational studies: Anliker et al 1990 Growth study n=104 Klesges 1991 Lab and cafeteria n=53 Details were not presented for several studies: Koblinsky et al 1987, Berenbaum 1986, Birch et al 1987, Harper et al 1975 (young children) <u>Participant characteristics</u> Age range - 2 years to 'pre-kindergarten' (around 5 years) Ethnicity - none stated Socio-economic grouping - none stated <u>Search strategy</u> Databases searched included: AGRICOLA, CRIS, MEDLINE, ERIC, HNRIMS, PSYCHINFO, Psychological Abstracts, NHLBI and Food, Science, and		Davis et al 1983 Activity- and food-based activities, including songs and stories: 8 activities/week for 6 weeks No controls Assessment – pre-test, post-test, nutritional knowledge and food preferences Community Research Centre 1980 Student Parent Educator Administrator Children (SPEAC) Preschool Nutrition Education Project developed to integrate the USDA Child Care Food Programme with the education curricula and selected child care programme activities in Minneapolis US 1979-1980 Activity- and food-based activities for 7 months Int n=139; Con n=29 Assessment – pre-test, post-test, food preferences Hunsley 1982 NET preschool programme ('Nutriphonics') in Iowa, US Activity- and food-based activities, varying in length of time by site 14-unit learning package (30 min, 3 times/week), emphasised choosing nutritious foods as opposed to nutritional knowledge Int and Con groups Assessment – pre-test, post-test, food preferences	Davis et al 1983 ▪ A 6 week activity programme led to a significant improvement in knowledge of food sources and nutrient functions but no change in behaviour (food tasting) Community Research Centre 1980 ▪ The Student Parent Educator Administrator Children (SPEAC) Preschool Nutrition Education Project, a 7 month activity programme, led to a significant increase in preference for fruit, vegetables and dairy foods Hunsley 1982 ▪ NET preschool learning package ('Nutriphonics') in US, concentrating on choosing nutritious food - no significant effect (for choosing nutritious snacks vs. an empty calorie snack or for assembling a healthy meal)	

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		Technology Abstracts; Psychlit; and AgeLine. The authors manually searched a number of key journals. Reports and information were sought from various agencies and key individuals.		Berenbaum 1986 'Good beginnings', a nutritional education programme for preschoolers 10 weeks Assessment – nutritional knowledge and behaviour Byrd-Bredbenner et al 1993 Head Start Activity- and food-based activities for 6 weeks (Children Get a Head Start on the Road to Good Nutrition curriculum for children aged 2-5 y using trained teachers) Int and Con groups Assessment – pre-test, post-test, nutritional knowledge, attitudes and food preferences Lawatsch 1980 Fairy tales with benefit or threat appeal for vegetables for 3 days. 2 Int and 1 Con group Assessment – pre-test, post-test, nutritional knowledge, attitudes and food preferences <u>5. Behavioural interventions affecting food and nutrition behaviour</u> Nutritional knowledge was not measured in these studies Birch 1980a Peer modelling, then follow-up at 6 weeks Assessment – pre-test, post-test, food preferences Birch et al 1980b	Berenbaum 1986 ▪ The 'Good beginnings' nutritional education programme for preschoolers gave increased knowledge but no change in attitude or behaviour Byrd-Bredbenner et al 1993 ▪ Head Start activities for 6 weeks led to no significant change in nutritional knowledge but significant changes in 2 of 3 attitude scales. For behaviour, children were less likely to refuse foods offered at Head Start classrooms and more likely to request low-sugar snacks. Lawatsch 1980 ▪ Both interventions gave higher nutritional knowledge scores but the benefit approach was more effective and also gave a higher score for choice of vegetable snacks <u>5. Behavioural interventions affecting food and nutrition behaviour</u> ▪ Food acceptance was enhanced by repeated exposure to food, peer and adult modelling, positive emotional tone in the social context when foods are offered, and appropriate use of awards Birch 1980a ▪ Peer modelling – targeted children (sitting next to 3 or 4 children who like the vegetable) changed preferences for vegetables for initially non-preferred choices. The changed preference was still apparent after 6 weeks. Birch et al 1980b	

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				Foods given as a reward, with no reward, positive attention by adult (preschool teacher), non-social conditions, and control for 6 weeks. 3 Int and 1 Con groups Assessment – pre-test, post-test, food preferences Birch and Marlin 1982 2,5,10,15 or 20 exposures to novel foods in 5 different Int groups for 6 weeks Assessment – pre-test, post-test, food preferences Birch et al 1984 Children consumed a beverage in order to get a reward for 6 weeks 4 Int and 2 Con groups Assessment – pre-test, post-test, food preferences Birch et al 1987 Repeated exposure to novel foods 5, 10 or 15 times. Children were divided into different age groups. Children could either 'look' (see and smell food) or 'taste' (see, smell and taste food) for 30 days Assessment – pre-test, post-test, food preferences Stark et al 1986 Cueing and contingent rewards (using stickers and praise) for choosing a healthy snack for 65 days Assessment – pre-test, post-test,	▪ Presenting foods as rewards or with positive adult attention improved food preferences but presenting foods in a non-social context or at snack time control did not Birch and Marlin 1982 ▪ Food preferences improved in proportion to increased exposure – requiring a minimum of 8-10 exposures and a clear effect after 12-15 exposures ▪ 2-3 year-olds were more reluctant to taste new foods than 5-6 year-olds Birch et al 1984 ▪ Offering a reward for consuming a disliked beverage significantly decreased preference for the beverage Birch et al 1987 ▪ Increased preference for foods after repeated exposure was more likely if foods were tasted in addition to being seen Stark et al 1986 ▪ Rewards (stickers and praise) increased healthy snack choices but just at school; after withdrawal of the rewards, healthy snack choice reverted to baseline level	

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				preferences for snacks Harper et al 1975 Food offered by adults who were/were not eating it themselves <u>6. Effect of public service announcements and television ads on preschool children's food choices, with and without adult comment</u> Galst 1980 4 Int groups: TV food adverts for high sugar products with/without parent's presence and comments; TV adverts for low sugar products and public service announcements about fresh fruit and vegetables, dairy products and other basic food groups which discouraged consumption of highly sugared foods with/without parent's presence and comments; and a control group. For 4 weeks Assessment – pre-test, post-test, preferences for snacks chosen at preschool containing sugar	Harper et al 1975 ▪ Children were more likely to prefer a food which was offered by adults who were eating it themselves <u>6. Effect of public service announcements and television ads on preschool children's food choices, with and without adult comment</u> Galst 1980 ▪ In one study, positive adult evaluative comments accompanying low-sugar ads and pro-nutrition public service announcements had a positive influence on food choices (reduced consumption of snacks containing sugar at preschool)	

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Elkan et al. 2000 SR 2+	The review objective was to examine the effectiveness and cost-effectiveness of home visiting by health visitors. This also included an assessment of home visiting in improving children's diet.	Inclusion/exclusion criteria 1. Studies that reported home visiting outcomes relevant to British health visitors were included 2. The personnel involved in carrying out the programme had to have responsibilities that were within the remit of British health visitors, and could not be members of a professional group other than health visiting 3. At least one home visit was made 4. Studies had to include a comparison group (RCTs, non-RCTs and controlled before-and-after comparisons) Three studies of the 102 included in the SR were relevant to improving the diet of children aged 2-5 y	Quality of individual studies was assessed using a standardised quality checklist – an adapted Reich scale, which included randomisation, concealment of allocation, blinding, power calculation and ITT analysis.	Gutelius The intervention in the US study was 9, 6 and 4 home visits in the 1st, 2nd and 3rd years of life, respectively (minimum 1 h per visit) by a paediatrician or nurse, using a mobile coach parked outside the home, from 7 months pregnant to 3 y old versus no home visits. Additionally, 16 group events, usually discussion sessions, for 1 year. (Advice was based on Dr Benjamin Spock's book 'Baby and Child Care') Also 8-16 mg Fe daily for ≥1st year of life. Evaluation at 6, 12, 24 and 36 months. (No details of dietary assessment given.) 6% loss to follow-up (2 infants excluded due to retardation) For the 2 Barker studies (Barker 1988 and 1994), the intervention was monthly health visitor home visits versus no home visits. Evaluation at 12 and 36 months. Maternal self report for dietary	Elkan et al. summary and conclusion: The authors reported that 3 of the 4 studies (excluding Barker 1994) reported better nutritional outcomes among home-visited children. They also concluded that the studies relied on maternal self-reports to assess diet and may thus be subject to bias. The author's state that there is insufficient evidence to make any conclusions. Results for Gutelius 1977 and Barker 1988 and 1994 Results for individual foods/nutrients % with >1 daily serving of fruit or fruit juice Int 51% Con 33% p<0.05 at 24 months Gutelius Int 57% Con 38% p<0.05 at 36 months Gutelius % with an adequate fruit intake at 12 months Int 63% Con 68% at 12 months Barker 1994 Int 76% Con 76% at 36 months Barker 1994 % with an adequate vegetable intake Int 73% Con 76% at 12 months Barker 1994 Int 77% Con 77% at 36 months Barker 1994 % with >1 daily serving of meat at 6 months Int 88% Con 75% p<0.05 Gutelius % with an adequate animal protein intake Int 87% Con 87% at 12 months Barker 1994 Int 92% Con 90% at 36 months Barker 1994 % with an adequate non-animal protein intake Int 82% Con 84% at 12 months Barker 1994 Int 89% Con 83% at 36 months Barker 1994 % with an adequate whole food intake Int 70% Con 79% at 12 months Barker 1994 Int 80% Con 78% at 36 months Barker 1994	The results appear to be applicable to the UK. Two of the 3 studies were in the UK. Limitations of included studies: many were too small to detect effects, some were unrandomised with unblinded or self-reported outcome assessment The Child Development Programme (CDP) developed at the Early Childhood Development Unit, Bristol was described in the 2 included studies by Barker 1988 & 1994. Review funded via the Health Technology Assessment NHS R&D HTA Programme (UK).

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		(2 RCTs and 1 non-RCT). One study was of children of 1st time mothers: Gutelius 1977, a Washington, US, RCT of low income black infants in the 1st 3 years born to normal unmarried schoolgirls aged 15-18 y with normal births (n=97: Int n=49; Con n=48) Int and Con groups only differed in 6 of >90 variables, of these 5 favoured the Con group. The 2 remaining studies concerned 3-27 month old infants on normal health visitor caseloads: Barker 1988, in NW and NE England, W Glamorgan and Dublin (health visitors) (n=1051; Int n=678; Con n=373) and Barker 1994 (non-RCT), in Northern Ireland (public health and family development nurses (n=606: Int n=	Reich scores: Gutelius 1977 0.59 RCT moderate Gutelius 1977 (from original paper) Randomisation using random numbers. Barker 1988 0.46 RCT borderline Barker 1994 0.46 non-RCT borderline Additional quality	assessment.	% with an adequate energy intake Int 87% Con 92% at 12 months Barker 1994 Int 94% Con 88% at 36 months Barker 1994 <u>Results for vitamins and minerals</u> % of children with <50% of RDA Barker 1988 At age 12 months At age 36 months Int Con Int Con Iron 10 5 5 5 Zinc 5 3 22 54 Calcium 0 0 0 0 Vitamin C 21 11 36 27 Total folate 2 0 18 35 <u>Results for feeding habits</u> % with a good appetite (mother's opinion) at 6 months Int 76% Con 60% p<0.05 Gutelius % with a good appetite (mother's opinion) at 24 months Int 53% Con 35% p<0.05 Gutelius % feeding self at 24 months Int 71% Con 48% p<0.05 Gutelius Significant results were reported for the Gutelius study but no estimations of significance were reported for the Barker studies. It appears that many of the results of the Barker 1994 study were unlikely to be significant.	

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		384; Con n=222,). Search of electronic databases included Medline (1966-1997), CINAHL (1982-1997), EMBASE (1980-1997), the Internet, the Cochrane Library, relevant journals and references lists. Key individuals and organisations were also contacted and advertisements made in journals	information (where available)			

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Tedstone 1998 SR 2++	To determine the effectiveness of interventions to promote healthy eating in preschool children aged 1 to 5 years.	Inclusion criteria Study design - RCTs, non-randomised CTs, prospective cohort studies, studies with historical or retrospective control groups. Interventions - Healthy eating promotion Participants – 1-5 year old children or their parents, other family members or carers. Countries - Western industrialised countries Exclusion criteria Observational studies. Children living in institutions or in high risk populations i.e. obese or with dietary fads or allergies. Studies in ethnic groups not represented widely in the UK. 14 studies included in review. All US studies but 1 in the	Quality Assessment criteria - study design, sample size and power, comparability of intervention and control groups, rates of attrition, confounders, blinding, data collection methods, treatment of potential bias. Graded from poor to good. Studies not thought to have 'sufficient rigour to ensure the validity of the results' were excluded - some poorly executed studies which were 'based on the setting and type of intervention which are relevant to the UK population'	Interventions aimed at children in a preschool or day-care setting 1. Using traditional teaching methods Byrd-Bredbenner 1993 65 Healthy Start centres randomised Intervention: Head Start classrooms: new curriculum for 6 weeks (45-55 min/week) by trained (3 h) volunteer classroom teachers: including games, puzzles, songs, art activities and food preparation Int n=200, Con n=232 Lawatsch 1990 4 preschool classes randomised Teaching strategy based on threat vs. benefit using traditional children's stories (Little Red Riding Hood, The Three Little Pigs, Goldilocks and the 3 Bears). Intervention: 2 different approaches: 'threat of not eating vegetables' vs. benefit of eating vegetables' for 3 consecutive days each Controls: not read the stories No details of nos. in each group Assessment using pictorial tests before and after the intervention Gorelick 1985 California state University nutrition education kit. Preschool classes at different	1. Using traditional teaching methods Byrd-Bredbenner 1993 (Healthy Start) ▪ Nutrition education in classrooms improved nutrition knowledge/food knowledge, identification of foods, classification of foods, increased requests for low sugar snacks (12% increase in intervention group vs. 6% fall in control group) & reduced food refusal (significance unknown). Attitudes towards eating nutritious foods and eating new foods significantly increased, p<0.05 and p<0.002, respectively, but not attitude to towards eating vegetables. Lawatsch 1990 ▪ Teaching strategies based on threat vs benefit using traditional children's stories improved attitude and increased knowledge in both groups when compared to controls, p<0.05; but only the benefit approach improved selection of vegetables, p<0.05, and the effect was greater overall with the benefit approach, p<0.05 Gorelick 1985 (California state University nutrition education kit) ▪ Intervention group had increased nutritional knowledge after the intervention, p<0.001, and higher knowledge scores than the control	.All these interventions are applicable to UK settings Nutrition education for both pre-school children and their carers is effective in increasing knowledge and improving attitudes to healthy eating; although this is a desirable outcome, the impact on actual intake is not clear from this review because of the paucity of studies examining this outcome. Gorelick 1985, Peterson 1984 These studies did not adjust for socioecomic or educational differences in the children. Birch 1987 gave very little detail of

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		UK (James 1992) RCTs Byrd-Bredbenner 1993 Age 4-5 y, n=1000 Lawatsch 1990 Age 3.5-5.25 y, n=103 Gorelick 1985 Age 3-5 y, n=187 Peterson 1984 Age 5-6 y, n=106 Essa 1988 Age 3-4 y, n=60 Singleton 1992 Mean age 5.1, range 4-7 y, n=60 Before-after Turner 1987 Age 4-5 y, n=55 Lee 1984 Age 3-5 y, n=60 James 1992 Age 1-4 y, n=44 Smith 1986 (WIC) Age <5 y, n=50 Non-RCT Koblinsky 1992 mothers of preschool children, n=171 Cohort with comparison Robert-Gray 1989 Pre-school children, 54 child day care centres Experimental	were included. RCTs Byrd-Bredbenner 1993 poor/ moderate Possible bias as same teachers did teaching and evaluation, no details of selection of subset of children for evaluation Lawatsch 1990 moderate Gorelick 1985 moderate Did not pre-test control children Peterson 1984 moderate Essa 1988 moderate Many study details missing Singleton 1992 moderate Before-after Turner 1987 poor/moderate i.e. 1- lack of info on selection	schools randomised (Int: n=93, Con: n=94) Intervention: the education kit included lesson plans, resource material and support information. Usual classroom teacher trained on the use of the kit. 2 classroom activities/week for 6 weeks Assessment: 7 part test before and after the intervention Controls – no details 2. Using other teaching methods Peterson 1984 video Pro-nutritional videos. 6 kindergarten classes randomised. Int n=56; Con n=50 Intervention: 10x20 min videos on healthy eating and nutritional themes specially prepared from popular children's TV - on consecutive days Controls: no specific details Assessment: before and after questionnaires, including healthy/unhealthy foods, attitudes, etc. Turner 1987 computer teaching Compared traditional story telling and puppets with a computer-based educational package delivered by a researcher in the presence of a teacher. 2 community and one university pre-schools. 4 groups: 2 groups computer-based intervention university n=18, community n=13;	group, p<0.01. Younger children (age 3) performed less well than older children. 2. Using other teaching methods Peterson 1984 Video ▪ Video programmes showing healthy eating messages improved nutrition knowledge and understanding (p< 0.05); no effect on food preference or food choice (snack choice) (Petersen commented that, despite seeing 200 min of videos on healthy eating during the intervention, at the same time the children would have been exposed to 330 min of TV advertisements re unhealthy foods) Turner 1987 ▪ Both computer and traditional story-telling teaching methods improved nutrition knowledge (p<0.05) Less knowledge was gained in the university-based computer group than the community based computer group (p<0.05)	recruitment or demographics of the included children. Koblinsky 1992 New York Int group more likely to be Hispanic than the corresponding Con group and the Maryland groups were more likely to be employed or married and on average better educated than the New York groups. 41% mothers in New York read the newsletters compared to 21% in Maryland; 53% and 23%, respectively, regularly attended the workshops. Smith 1986 Small study because most of the identified anaemic children were participating in the WIC programme –

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		Birch 1984 Mean age 4.2, range 3-5 y, n=45 Birch 1987 Age 23-30 m, n=43 <u>Participant characteristics</u> Age range -The range of ages of the children in the US studies was 1 to 7 y but the majority were aged 3-5 y and only 2 studies of children older than age 5. Ethnicity- 2 US studies were multi-ethnic (Byrd-Bredbenner 1993, Koblinsky 1992), 4 of mainly white children (Gorelick 1985, Essa 1988, Lee 1984, Singleton 1992). Socio-economic grouping - Subjects for 2 US studies were of diverse socio-economic status (Gorelick 1985); 4 were of low socio-economic status (Byrd-Bredbenner 1993, Koblinsky 1992, Smith 1986, James 1992); and 3	of children and group allocation Lee 1984 moderate/good i.e.1+. Not all relevant data supplied, lack of power with small nos. James 1992 moderate Before-after, no control group, no statistical analysis, possible bias as recruitment method unspecified Smith 1986 moderate/poor <u>Non-RCT</u> Koblinsky 1992 moderate Interpretation difficult due to demographic differences between groups due to non-random allocation process <u>Cohort with</u>	2 groups traditional teaching intervention university n=11, community n=13. Both interventions: 15 min, groups of 4-6 children listening to and participating, labelling and recalling foods illustrated in the story Assessment: Before and after verbal and non-verbal food recognition and recall tests. 2 weeks before and 2 weeks after the interventions 3. Using a behavioural modification approach Birch 1984 Inducement by reward 1 pre-school facility 4 weeks of twice weekly sessions to increase consumption of beverages ranked neutrally or refused to drink at baseline session Experimental group: n=31, randomised to receive 4 types of rewards for drinking the beverages Control: n=7 same conditions, no rewards Birch 1987 Repeated exposure to novel foods. Children were divided into 3 age groups and randomly assigned to 7 different interventions. Children could either 'look' (see and smell food) or 'taste' (see, smell and taste food). 30 day experimental	3. Using a behavioural modification approach Birch 1984 ▪ Inducement based on reward reduced consumption of previously disliked beverages compared to no reward ($p<0.01$) Promotion based on reward is unlikely to be successful in bringing about dietary change Birch 1987 ▪ Taste exposure frequency was related to increased consumption of novel foods ($p<0.05$) but not visual exposure frequency. Visual food preference was related to both frequency of taste and visual exposure, $p<0.05$ and $p=0.02$, respectively.	shortage of non-WIC participants. The non-WIC controls appeared to have lower haemoglobin levels at baseline than the WIC children. Funding The UK NHS, carried out by the HEA

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		of the middle to upper classes (Essa 1988, Lee 1984, Singleton 1992). 4 studies gave no relevant information. The UK study (James 1992) was of inner city Bristol children aged 1-4 y, predominantly with single mothers on social security. Search strategy Years searched-1984 to 1996. Databases - MEDLINE, CINAHL, Cochrane Library, Cochrane – Pregnancy & Child, Unicorn, BIDS embase, BIDS CAB Health, BIDS SCI, ERIC, Health star, HEBS, SIGLE, PSYCHLIT, Popstar, ASIA, HEA (National Database for Health Promotion in Primary Care). Hand searches - 10 journals and relevant papers Grey literature - sought from several	comparison Robert-Gray 1989 poor Experimental Birch 1984 moderate Birch 1987 moderate	procedure where foods were presented 5, 10 or 15 times. Assessment of food preferences made 4-5 days after intervention Intervention aimed at children that combines preschool and home settings Essa 1988 Parental involvement in a preschool nutrition education programme 3 preschools randomised, 2 interventions Int 1: parental involvement, introductory information and discussion session and home support activity packs n=23 Int 2: no parental involvement n=22 Con: no special nutritional instructions n=15 Nutrition programme: 10 weeks 2 classroom activities/week by classroom teacher with prior training and weekly training specific to that week's activities Assessment Pre- and post-test of basic foods, need for a balanced diet and diet and health Intervention aimed at children that compares preschool and home settings Lee 1984 Children recruited from a university child development laboratory, parents and teachers	Intervention aimed at children that combines preschool and home settings Essa 1988 ▪ The preschool intervention was effective in increasing knowledge with or without parental involvement at home, p<0.001. ▪ Parental involvement increased knowledge, p<0.05 Intervention aimed at children that compares preschool and home settings Lee 1984 ▪ Both the parent-taught and the teacher-taught curricula increased nutritional knowledge, p<0.001 but the teacher-taught intervention was more effective. (All 3 groups showed an improved ability for food	

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		sources. Language- English publications only		had similar training but trained in their separate groups. Intervention programme: 8 weeks 15-20 min/day, based on 2 nutrition education teaching manuals with the same curriculum, one for home and one for school (developed, pre-tested and modified over 2 y) n=20 for both intervention groups and control group (Int 1 carried out by parents at home: Int 2 carried out by teachers at school: Con no additional teaching) Assessment in children of food identification, role of nutrients in the body and health <u>Intervention aimed at children via parents in a home setting</u> Singleton 1992 Hearthrob home-based nutrition education programme Intervention: n=30, 4 week nutrition programme, 8 audiotapes 2/week + follow-along picture book for child and guidebook for parents with ideas for home activities - aim a low fat and healthy diet Assessment pre- and post-intervention interviews by researchers to assess child's understanding of health and its relationship to food using open concept map questions and a score for closed questions.	recognition, p<0.05) ▪ The age of the child was positively related to test score only in the home-taught group, p<0.02. <u>Intervention aimed at children via parents in a home setting</u> Singleton 1992 Hearthrob home-based nutrition education programme ▪ The parent led home-based intervention improved children's understanding of nutrition related to health but only when open as opposed to closed questions were used, p<0.001.	

Author, year, Design Quality	Review question	Study populations	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
				<u>Intervention aimed at carers (mothers) in a combined primary-care and home setting</u> James 1992 Before and after study, n=44 mothers. Intervention: Health visitor and GPs trained in 5xhalf-day seminars by 2 hospital dietitians. Mothers initially recorded 7 day diet diaries of their children. Health visitors used results to tailor dietary advice and set realistic objectives. Health visitors visited mother's to provide follow-up advice for the next 16-20 weeks, mean 8-9 h teaching. Aim: healthy diet, improved organisational skills (shopping and meal planning), regular meals, eating together 7 Day diet diary repeated at end of study <u>Welfare scheme healthy eating programmes targeting parents</u> Koblinsky 1992 Head Start – child development programme for low-income families, including nutrition education in the preschool curriculum carried out at Head Start centres in Maryland and New York Intervention: 13 weekly easy-to-read nutrition newsletters and 4 workshops over 2 months (2 h each, 2 weeks apart) including	<u>Intervention aimed at carers (mothers) in a combined primary-care and home setting</u> James 1992 ▪ Regular advice on diet and organisational skills led to improvements in children's diets, $p<0.01$, with fruit and protein containing iron eaten more frequently and in mother's organisational food tasks, $p<0.01$, with meal planning, eating as a family and regular meals more commonly reported <u>Welfare scheme healthy eating programmes targeting parents</u> Koblinsky 1992 Head Start programme, USA ▪ Weekly newsletters and nutrition education workshops for mothers for 2 months in Maryland led to improvements in mothers' nutrition-related behaviour, diet quality, $p<0.01$, diversity of foods, $p<0.05$, reportedly eaten by children. Improvements due to an increased intakes of dairy foods ($p<0.01$), vegetables ($p<0.01$), and bread and grains ($p<0.05$) ▪ The same intervention in New York was less successful - leading to an intention to reduce sugar ($p<0.01$) and salt intake ($p<0.05$) only	

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				presentations, hands on activities, small group discussion and food demonstrations (Head Start) including: nutrition of and feeding the preschool child; meal planning and preparation; food shopping skills. Incentives to attend: food vouchers, free babysitting. 3 centres in New York, n=41mothers; 2 in Maryland n=48 mothers Controls: usual Head Start Programme 3 centres in both New York n= 52 and Maryland n=30 Assessment: pre- and post-intervention FFQ of child's' dietary quality and diversity Smith 1986 WIC Retrospective study of 780 anaemic children (Haemoglobin <11 g/L), 200 selected randomly, one group selected enrolled already in WIC programme (Int group n=25); and another group, matched for age sex and race, not enrolled in WIC Con group n=25) WIC programme: at enrolment parents complete 24 h dietary recall for child including FFQ for certain foods. Childs' diet assessed against the programme's Child Health & Disability Prevention Screening Forms (CHDP) used as a basis	Smith 1986 WIC, USA ▪ Individual counselling and classroom education of parents of children diagnosed with anaemia led to improvements in uptake of children's food vouchers and higher haemoglobin concentration. Mean Haemoglobin levels (g/dL) WIC (n=25) non-WIC (n=25) p Baseline 10.8 10.0 ? After 6 months 11.8 11.1 <0.05	

Author, year, Design Quality	Review question	Study populations	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
				for a 30 min dietary counselling session on how to remedy nutritional deficiencies. Also 30 min classes on how to improve diet, particularly w.r.t. iron, calcium, protein, vitamins A and C, including meal planning and preparation and the importance of the child-parent relationship. <u>Interventions aimed at daycare staff</u> Roberts-Gray 1989 Texas Nutrition and Education Training Programme 54 day care centres Intervention: 24 day care centres. A single day or half-day workshop for daycare meal providers on the menus offered to children at their centres, given by dietitians using problem-solving and immediate feedback exercises. Aim: to improve attitudes of meal providers towards food and nutritional knowledge, enhance quality of meals and snacks provided at centres Controls: 30 day care centres where staff did not attend the workshops Assessment: Staff at day care centres asked to provide 10 day menu plans 2 weeks prior and 6 and 12 weeks after the workshop. Follow-up from 20 Int and 20 Con	<u>Interventions aimed at day-care staff</u> Roberts-Gray 1989 ▪ Brief nutrition education for day care staff (a single workshop) is not effective in improving menu-planning	

Author, year, Design Quality	Review question	Study populations	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
				daycare centres		

First author Year	Research Question	Study populations	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
Thomas et al. 2003 UK SR 2+ Includes Hendy et al. 1999 Quasi-experimental study graded as 'sound' by reviewer Wardle et al.	To find the barriers to, and facilitators of, healthy eating amongst children aged 4 to 10 years old and provide practitioners, policy makers and researchers with a summary of evidence to help them plan interventions for children likely to be effective in bringing about sustainable behavioural change.	Search strategy: 2 stages 1. Mapping and quality screening exercise: Studies focussed on children aged 4 to 10 y and published in the English language. Evaluations of the effects of interventions to promote healthy eating amongst children carried out in any country. Also non-intervention research aiming to describe factors influencing healthy eating amongst children in the UK; evaluations looking at processes involved in implementing interventions; and previous systematic reviews. 2. In depth review: Barriers to, and facilitators of, children's consumption of fruit and vegetables. Including in-depth	Review used 4 methodological quality criteria developed for EPPI-Centre Health promotion reviews: 1. Pre-intervention data provided for all subjects 2. Post-intervention data provided for all groups 3. Findings reported for each outcome mentioned in study aims 4. Control/ comparison group equivalent to Int group on socio-demographic and outcome variables If a study meets all 4 criteria it is 'sound' 3 categories thus used for studies: 'high',	Hendy 1999 Interventions and control: compared the effectiveness of 5 teacher actions to encourage children's acceptance of 4 new fruits and vegetables presented during 3 preschool lunches on consecutive days: (i) Control: Simple exposure (teacher could answer children's questions briefly but otherwise said nothing) (ii)Reward: Teacher said 'If you try 2 of these new foods with at least one bite, you can have a special dessert. If you try all of these new foods, you can also have a candy to take home for later.' (iii)Modelling: Teacher placed each of the foods on his/her own plate and ate ≥2 bites of each food and said 'I like to try new foods'. (iv)Insist that children try one bite. (v)Choice offering: Teacher asked 'Do you want any of this?', gave a small sample of food if the child said 'yes', moved on to the next child if they said 'no'. Foods included a variety of textures and colours and could be handled without utensils, observations for 20 min.	Hendy 1999 In factorial analyses of variance (2 genders x 5 teacher actions), the 5 teacher actions produced differences in the no. of foods sampled ($p<0.001$), no. of meals during which foods were sampled ($p<0.004$), and total no. of bites ($p<0.002$). Paired comparisons showed that reward, insisting and choice-offering were more effective than simple exposure to encourage no. of foods, no. of meals where foods were sampled and no. of bites. Dessert reward and choice-offering were equally effective for all 3 measures of food acceptance but insisting produced fewer bites than choice-offering. Teacher modelling was ineffective compared to simple exposure. There was no gender difference for new food acceptance or interaction with the 5 teacher actions to encourage new food acceptance The 2 studies contributed to several conclusions made by Thomas including: Children consider taste, not health, to be a key influence on food choice. Implications of the studies for interventions included: Promote children's favourite fruit and vegetables or target the ones they don't like. Reduce the emphasis on health messages particularly the ones which concern future health Do not promote fruit and vegetables in the same intervention	The results may be applicable to the UK The Wardle 2003 RCT has already been extracted individually for this review. The review implies that the giving of 'rewards' for trying new foods was only successful on a short term basis. Choice-offering appeared to have the strongest results in the Hendy study. Review commissioned by the DoH (England) and carried out by the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre), Social Science Research Unit, Institute of Education,

First author Year	Research Question	Study populations	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
2003 RCT 1+		intervention studies measuring fruit and vegetable outcomes and studies that examined children's own perspectives on food and eating to assess how these might illuminate fruit and vegetable barriers and facilitators. Only studies with a control group for intervention studies. Studies published since 1990 Searches in 6 major databases and 8 specialist registers. Database search using controlled vocabulary and free-text terms, combining conceptual components devised in Medline and translated to other databases. Searches carried out in Nov 2001. No methodological filters. Hand searching of 3 relevant journals and	'medium' or 'unsound' Both included relevant studies were considered to be 'sound': Hendy 1999 Quasi-experimental study Wardle 2003 RCT	Wardle 2003 This study has already been extracted individually for this NICE review.		University of London

First auth or Year	Research Question	Study populations	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
		bibliographies of relevant studies. Authors of relevant studies and relevant UK organisations also contacted for additional reports. Further details of inclusion/exclusion criteria given. 193 studies found for mapping exercise 41 studies found for in-depth review: 33 outcome evaluations and 8 studies of parents' or children's views Only 2 articles included in the in-depth review were of studies including children aged 4-5 y and were relevant to the NICE review. They were both mainly of children's views but Wardle 2003 also provided data on intake. Hendy 1999 USA Quasi-experimental study Pre-school n=64				

First auth or Year	Research Question	Study populations	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
		Age mean 58.4 m Sex mixed 50% boys SES 'mostly low income' Ethnicity >95% 'white' Wardle 2003b UK RCT based in the home of 2-6 y-old children n=156 Age mean 53.2 m Sex mixed SES not started Ethnicity not stated Region – urban				

First author Year	Research Question	Study population	Study Quality	Intervention	Main results	Comments Applicability to UK populations and settings Funding
Bannon et al. 2006 US RCT 1-	What is the impact of nutrition messages on children's food choice?	3 of 4 kindergarten classrooms at an elementary school n=50 children, 3 children excluded due to refusal (1) or illness (2) 23 girls: 27 boys Mean age 5.0±0.04 y Ethnicity: white (46); black (2); Hispanic/Latino (2) Mean per capita income = $28,882 (Connecticut Economic Ref Group F) No sig difference for age or ethnicity between classes. No children with special needs	Each class randomly assigned to watch a different video Order of presenting 2 questionnaires was randomised No details of method of randomisation given The authors stated that a larger sample size would have increased the statistical power Data were not given for the different intervention groups and pre-test and post-test assessment of food preference and healthy foods	Intervention: 3 different 60 second videos Gain-framed video: n=14 Showing children eating apples and giving a positive health message for apples Loss-framed video: n=18 Showing children refusing to eat fruit and illustrating the resulting negative health messages Control video: n=18 No health messages or fruit consumption After viewing the video children had a 10-15 min play break, and then chose a snack – an apple or a snack-sized bag of animal crackers. After snack time all received stickers of animated apples Assessment: Food preference questionnaire: 12 foods to circle if liked; corn, eggs, apples, milk, banana, green pepper, ice cream , soda, French fries, animal crackers, pizza, candy Healthy food questionnaire: the same 12 foods to circle if thought to be healthy	Children's snack choices % choosing apples animal crackers p value Gain frame 57.1 42.9 0.059 Loss frame 55.6 44.4 <0.05 Control 33.3 66.7 Both interventions gave rise to an increased choice of an apple for a snack but only the Loss-framed video intervention was significant. A pre-test preference for apples did not affect the result for the control and gain-framed video groups but an assessment could not be made for the gain-framed video group as all the children in the group had a pre-preference for animal crackers Pre-test and post-test % children endorsing foods as healthy or as liked Food / Is it healthy? Pre-test % / Is it healthy? Post-test % / Do you like it? Pre-test % / Do you like it? Post-test % Apples 98 98 85 90 Bananas 100 90 69 71 Candy 23 26 92 87 Animal crackers 23 31 94 87 Corn 90 98 67 69 Eggs 85 80 67 62 French fries 60 53 94 90 Green pepper 81 73 27 35 Ice cream 25 28 96 85 Milk 98 96 81 89 Pizza 79 77 98 94 Soda 42 37 79 73 There were no significant differences for % healthy or liked before and after the video	Possibly applicable to the UK This was a pilot study Long-term effects were not measured Experimenters observed the children's snack choices and their presence may have affected snack choice Only one suitable classroom was available so the videos were shown on successive days

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Blom-Hoffman 2004 US Cluster RCT 1-	To what extent does a multi-component prevention programme affect children's nutrition knowledge and actual behaviour change (vegetable consumption during school lunch) To what extent are classroom teacher and researcher able to implement knowledge based component of the prevention programme with	<u>Inclusion/Exclusion criteria</u> Not explicit <u>Participants</u> 6 kindergarten and first grade classes (3 intervention classes and 3 control classes) with 91 children whose parents consented <u>Participant characteristics</u> • African-American children • 95% eligible for free breakfast and lunch • Attending kindergarten and first grade children • In urban, under-resourced elementary school • Mean class size 25, range 23-26	70 children needed to detect a medium effect size at 0.5 level of significance Randomisation method not stated	<u>Intervention</u> Based on '5-a-day' goal • Classroom knowledge component titled Every Day, Lots of Ways curriculum of 10 detailed lesson plans to be delivered via co-teaching by a classroom teacher and a school psychology doctoral student over 5 weeks @ 2 lessons/week • Home component consisted of a newsletter with information to re-enforce the classroom messages for parents/carers • Lunchtime behaviour component consisted of classroom assistants asking children to identify fruit and vegetables, praise children who ate fruit and veg and gave them 'Five-a-Day' stickers if they ate fruit and veg. <u>Control group</u> No nutrition education, supervision or stickers provided in control classrooms <u>Follow-up</u> Knowledge multiple choice test, plate waste assessment of	• Children in the intervention group demonstrated more nutrition knowledge compared to those in the control groups (p<0.0001) • Knowledge gains of intervention group were maintained at 1 month follow-up • Knowledge gains in the control group increased from the 2 week follow-up to 1 month follow-up (p<0.0001) • No increases in vegetable consumption between intervention and control group <u>Process outcomes</u> • Implementation integrity was acceptable for classroom intervention • Implementation integrity was variable for the lunchroom intervention • Intervention acceptable to children	This intervention can be implemented in the UK Authors state that inconsistent behavioural effects may have been related to variations in lunchroom integrity The teachers found the curriculum acceptable Funding Support (for post-doctoral fellowship) from Maternal and Child Health Bureau, Department of Health and Human Services

	integrity To what extent are paraprofessionals able to implement behaviourally based component with integrity How acceptable is this programme to students, teachers and paraprofessionals			vegetable consumption only: pre-test and at 2 weeks and 1 month 91 of 150 (61%) completed assessment		

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Cottrell 2005 US RCT 1-	To evaluate the effectiveness of interventions aimed at increasing family physical activity and parent education about diet and activity for their children	Children enrolled in kindergarten classes (aged 4-6 years) were included Inclusion/exclusion criteria – none stated Children from 14 schools were randomised to intervention group, and children from 15 schools were randomised to the control group: 437 children were screened, 203 returned baseline questionnaires and 50 completed the programme Characteristics reported for 50 who completed the study: Intervention Control Female 13(54%) 15(58%) Mean age 5 y 5 y Mean age (parent) 33 y 35 y Mean education	Study quality Power calculation not reported Very high drop out rate No further information	Intervention group: children and parents were given 2 pedometers (one for parent and one for child) and step logs to record each participant's steps. Children and parents received information on increasing physical activity and reducing caloric intake (n=24 completed intervention). Control group: children received a pedometer and step log. Children and parents received information on age-appropriate diet and exercise for kindergarten children that differed from the intervention group (not specified) (n=26 completed intervention) Duration of study: 4 weeks	Child pedometer use: At 4 weeks, children in the intervention group recorded significantly more weekly steps on average than the control group (9815 vs. 7799) ($p<0.04$). Child diet intake: Children in the intervention group consumed on average significantly fewer sweets than the control group (8.4 vs. 9.1 foods consumed weekly) ($p<0.05$). Differences were not significant for average fruit, vegetable, meat or bread intake. Parents perceptions of child activity and diet: Parents of children in the intervention group reported significant increases in their encouragement to engage in physical activity compared to control group ($p<0.05$). However, both groups reported increases in children's physical activity and enjoyment in activity.	Unclear The authors report that one third of the children were at risk for being overweight, or were overweight. Study duration was relatively short. Funding – none stated

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		(parent) 15.4 y 14.2 y White (children) 24(100%) 26(100%) White (parents) 23(96%) 25(96%) Married (parents) 19(79%) 20(77%)				

Author, Year, Country Design Quality	Research Question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
Lagstrom 1997 Finland RCT 1-	To evaluate the impact of individualised and repeatedly given dietary counselling on fat intake and nutrient intake of children aged 8 months to 4 years	Inclusion: Children attending well-baby clinics aged 5m were invited to take part 1062 children from 1054 families (56.5% of the eligible age cohort) were randomised Intervention group (I) n=540 Control group (C) n=522 Participant characteristics At age 8 months ~40% infants still exclusively or partially breastfed. Breast milk intake not determined. Thus, nutrient intake of only formula-fed infants analysed at 8 months n=434: I n=219; C n=215 Energy intake slightly higher in Cs (I, 3364 (516)kj; C, 3525 (618) kj).	Study quality Power calculation not reported No details of method of randomisation. Blinding not possible due to type of intervention No other details	This study was a part of the Special Turku Coronary Risk Factor Intervention Project for Babies (STRIP) Intervention: individual families met a paediatrician, nutritionist and nurse at 1-3 month intervals from age 7m to 2y and then twice yearly, for counselling on how to reduce child's intake of saturated fats and cholesterol Aims Fat intake % energy of 30-35% by 3 y old and 30% thereafter. Polyunsaturated/monounsaturated/saturated fatty acid ratio P:M:S of 1:1:1 but in practice P+M:S of 2:1. Protein and carbohydrate intakes as % energy of 12-15% and 55-58%, respectively Details of advice: After 12 m to use skimmed milk and to add 2-3 teaspoons of rapeseed oil, vegetable oil or soft margarine to infant's food/day, use oil or soft margarine instead of butter in cooking, use foods with lower amounts of fat especially saturated fat, ample vegetables, fish twice a week after age 1 y. Control: standard care, met same	Intakes reported as mean (SD) * = p values reported were for the group effect overall Intakes at 8 and 13 months Fat intake in both I and C groups were lower than expected 8 months I (n=219) C (n=215) p Fat as % energy 29.0 (4.7) 28.8 (4.1) 0.72 Energy kJ 3364 (516) 3525 (618) * 0.12 Sat fat , % energy 12.7 (2.5) 12.6 (2.3) 0.83 Polyunsaturated fat as % energy 4.8 (0.9) 4.9 (0.8) 0.62 13 months I (n=466) C (n=449) Fat as % energy 26.2 (6.0) 28.0 (5.0) <0.001 Energy kJ 4054 (758) 4155 (763) * 0.12 Sat fat , % energy 9.0 (3.2.) 12.4 (3.1) <0.001 Polyunsaturated fat as % energy 5.1 (2.0) 3.8 (1.3) <.001 Intakes at 2, 3 and 4 years of age: Children in I group consumed less fat (p<0.001) at both ages) and less cholesterol (p<0.001 at both ages) than children in C group Intakes of carbohydrates and protein of children in I group as % energy intake were higher than those of children in C group (p<0.001 at both ages) 2 years I (n=421) C (n=433) p Fat g 37 (10) 42 (10) *<0.001 Cholesterol mg 132 (51) 157 (65) *<0.001 Energy kJ 4717 (824) 4807 (857) * 0.12 Fat as % energy 30.0 (5.0) 33.0 (4.8) <0.001 Sat fat , % energy 11.0 (2.8) 14.5 (3.0) <0.001 Polyunsaturated fat	The method of giving advice used here may be appropriate for the UK Assessment of children's' dietary intakes is via reports from mothers who have received regular counselling about the dietary intakes being advised for their child by three health professionals at their well child clinic Despite the low fat intake, intakes of other nutrients met recommended levels except for iron and vitamin D The online version of the paper has incomplete data tables. <u>Funding</u> Sponsored by the Ministry of Social

		No differences in fat, carbohydrate and protein intakes (29%, 59% and 12% energy intake, respectively in both groups), or saturated, monounsaturated and polyunsaturated fatty acid intakes. Low intake of vitamin D and calcium and excessive intake of salt in both groups		team twice a year with no detailed input on dietary fats Mothers encouraged to breastfeed for as long as feasible or continue formula feeding until age 12 m. Comparisons: Dietary intakes 3-4 day food records kept at 5-12 month intervals Follow-up at 24m 873/1062 (82%) Follow-up at 36m 813/1062 (77%) Follow-up at 48m 741/1062 (70%)	as % energy 5.3 (1.4) 4.4 (1.4) <0.001 3 years I (n=392) C (n=398) p Fat g 41 (11) 45 (11) *<0.001 Cholesterol mg 142 (54) 171 (66) *<0.001 Energy kJ 5082 (909) 5205 (984) * 0.12 Fat as % energy 31.0 (4.9) 33.4 (4.6) <0.001 Sat fat , % energy 12.0 (2.5) 14.7 (2.7) <0.001 Polyunsaturated fat as % energy 5.5 (1.4) 4.7 (1.2) <0.001 4 years I (n=353) C (n=359) p Fat g 45 (11) 49 (13) *<0.001 Cholesterol mg 153 (61) 182 (68) *<0.001 Energy kJ 5505 (959) 5699 (1052) * 0.12 Fat as % energy 31.2 (4.8) 33.1 (4.7) <0.001 *<0.001 Sat fat , % energy 12.1 (2.5) 14.6 (2.8) <0.001 *<0.001 Polyunsaturated fat as % energy 5.3 (1.2) 4.6 (1.2) <0.001 *<0.001 Conclusion: Fat intakes at 13 months and 2,3 and 4 years of age were lower in the I group (p<0.001 for fat, cholesterol and saturated fat) and higher for polyunsaturated fat (p<0.0001). There were no significant differences in energy intake. Other results are reported	Affairs and Health; the Yrjo Jahnsson Foundation; the Mannerheim League for Child Welfare; the Finnish Cardiac Research Foundation; the Foundation for Pediatric Research, Finland; the Academy of Finland; the Juho Vainio Foundation; the Signe and Ane Gyllenberg Foundation, Helsinki, Finland; the Turku University Foundation; Chymos Ltd, Lappeenranta, Finland; Raisio Group, Raisio, Finland; and Van den Bergh Foods Company, Helsinki

Author, Year, Country Design Quality	Research Question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
Lumeng and Hillman 2007 Michigan, USA Cross-over trial 1-	Will children consume more when eating in a larger group than when eating into a smaller group?	54 children aged 2.5 to 6.5 years attending a university preschool Classrooms were grouped by age 68% boys 74% white Mean age [SD] 4.2 [1.1] years Range 2.6-6.2 years	Power calculation not reported No details of method of randomisation Blinding not possible due to type of intervention Seventeen of the 54 included children participated in only one eating condition. Sixteen of the 54 children took part in additional sessions in order to form complete groups. All data (108 observations) were included in the analyses. Children who participated in both eating conditions did not differ by age, race or sex from those who participated in only one.	Children within each classroom were randomised into groups of three, groups of three were randomly combined into groups of nine, and order of participation in the small and large group conditions was randomised. The eating behaviour of each child was studied in two conditions: eating a snack in a small group (3 children) and eating a snack in a large group (9 children). The snack was plain graham crackers (Keebler)[1], which were given regularly as a snack in the preschool. Each child had fasted at least 1.5 hours before the snack session. Each child was served a 14g portion and had more crackers within reach. No time or portion limits were imposed. The snack was served during the regular snack time supervised by regular classroom teachers and a familiar research assistant in a quiet room familiar to the children. Mean [SD] time between conditions was 25.3 [21.3] days.	Groups of 3 54 observations Mean (95%CI) / Groups of 9 54 observations Mean (95%CI) Snack duration (min) 13.0 (11.0 to 15.0) / 12.4 (10.4 to 15.4) p=0.69 Amount eaten (g) 21.2 (17.3 to 25.1) / 24.8 (20.9 to 28.7) p=0.21 Eating rate (g/min) 2.4 (1.8 to 3.0) / 2.9 (2.3 to 3.5) p=0.34 Latency to eating initiation (min) 3.0 (2.2 to 3.8) / 1.9 (1.3 to 2.5) p=0.03 Adult prompts to eat per min 0.35 (0.15 to 0.55) / 0.90 (0.70 to 1.1) p=0.0002 Social interaction rating 3.1 (2.9 to 3.3) / 2.0 (1.8 to 2.2) p=0.001 Other results are reported, but not by intervention group, e.g. when the results were divided by length of snack, there was no effect of group size on amount eaten in snacks lasting less than 11.4 minutes, but in snacks lasting 11.4 minutes or more, large group size increased the amount eaten (34.5 [SD 16] vs. 26.5 [13.8] g, p=0.02). When the children ate in groups of nine, they ate about 30% more than when in groups of three during longer snacks. In the larger groups, the children started eating more rapidly, socialised less and ate at a slightly faster rate than when they ate in the smaller groups. After controlling for snack duration children ate slightly more in larger groups than when eating in smaller groups (24.8 [SD 15.9] vs. 21.2 [13.4] g, p=0.03). Authors conclude the group size effect merits consideration in designing eating behaviour interventions.	Each child was provided with a beverage of the teacher's choice at each snack session. Each child drank the same beverage in both conditions. 32 children drank milk, 12 juice and 2 water Prior studies have shown that there is a very high correlation between snack duration and amount eaten Funded by the American Heart Association. Sponsor had no role in study design; collection, analysis and interpretation of data; writing the report; or decision to submit the paper for publication

[1] In a commentary on this paper entitled *The social facilitation of food intake* on page 377 of the same edition of the journal, RF Drewett states “The graham cracker is more like a digestive biscuit than what would normally be called a cracker in the UK.”

Author, Year, Country Design Quality	Research question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
Wardle 2003 UK RCT 1+	To evaluate the effectiveness of an exposure led intervention, carried out by parents in the home, in increasing children's liking for a previously disliked vegetable.	Participants were children aged 2-6 and their principal care-giver (parents), who had taken part in a larger trial and had expressed an interest in taking part in further research to modify their children's acceptance of vegetables. Excluded 13 children who would not comply with experimental procedures in the pre-intervention taste test. Parent participants were mainly white, well educated with mean age of 36 years. Many of the mothers had chosen not to work. Participants 143 children (initially 77 boys and 68 girls) and their principal care giver randomised to Exposure (e) n = 50	<u>Study quality</u> Predicted that with ≥10 exposures children would increase liking and consumption of a disliked vegetable The analysis excluded 14 exposure group subjects who failed to complete a minimum of 10 of the 14 tasting sessions of which 4 completed 9 tastings, 2 completed 8 tastings, 2 completed 7 tastings, 1 completed 6 tastings and 4 completed ≤5 tastings. Analysis including all subjects in the exposure group	Pre randomisation taste test of 6 vegetables (carrot, celery, tomato, red pepper, green pepper and cucumber) and a target vegetable selected on basis of moderately low ranking from the initial preference test Exposure (e) n=50 Parents were asked to offer child a taste of their target vegetable daily for 14 consecutive days. Encouragement given but no reward for consumption. Vegetable diary kept by parent and child recorded their liking (like, OK, dislike) using face stickers Information (i) n=48 Informed about '5 a day' recommendation and given leaflet with advice and suggestions for increasing children's fruit and vegetable intake. Told they would be given further advice at a second visit Control c n=45 Told they would be visited in 2 weeks and given advice on healthy eating in children Assessment	Greater increase in liking, ranking and consumption of a 'target vegetable from the pre-to post – intervention occurred in the Exposure group than in the other two groups. Rated liking Exposure v. Information p<0.001, Exposure v. Control p<0.05, There was also a significant group by time interaction p<0.001 Preference ranking Exposure group differed only from Information group p<0.05 Nearly 30% children in Exposure group ranked target vegetable as most liked compared to 5% of control group and 2% of information group Again there was a significant group by time interaction p<0.001 Consumption Only Exposure group increased intake significantly p<0.001 Mean (SEM) intake (g) of target vegetable (raw data) e (n=34) i (n=48) c (n=44) Baseline 4.1(1.4) 5.7 (2.1) 5.7 (1.5) After 2 weeks 9.0(1.7) 7.3 (1.8) 7.7 (1.6) When children who failed to achieve 10 exposures were included in the analysis, the group by time interaction for consumption was only marginally significant, p=0.07 Only the Exposure group showed significant increases in all three outcomes Parental response to the intervention Mostly extremely positive. 55% had used the exposure method again with other foods. Comments from the exposure group: the child enjoyed the tasting sessions, seemed more willing to try new foods, parents encouraged to be more adventurous with food. Criticised intervention for its duration	UK study The order of preference for the 6 vegetables (most liked first) was carrot, cucumber, tomato, celery, green pepper, red pepper. The colourful vegetable diary and stickers may have acted as a reward? Funded by Cancer Research UK

		Information (I) n = 48 Control n = 45 Participant Characteristics Children e I c Sex F 17 28 23 M 33 22 22 Age (months) Range 34 – 82 Mean 53.2 (SD 9.4) Caregivers Mothers 95% Fathers 5% Age (years) Mean 36.4 (SD 9.4) White 74% Left full-time education at 21 or over 68%	produced similar but less marked results. No other quality details given	Pre- and post-intervention tests in child's' home with mother or father present Scores for vegetables from 1 (most liked) to 6 (least liked) Consumption (g) Follow-up for 140/143 at 2 weeks, 98% (2 children in e group and 1 child in c group withdrawn by parents) At 6 weeks 20 children's parents (10e; 5i; 5c) completed semi-structured interviews by telephone to discuss the acceptability of the intervention, the value of the advice and their continuing use of the strategies.		

2 What interventions effectively promote the uptake of recommended vitamin and micronutrient supplements?

No studies were identified in the literature that addressed this question.

3 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?

Studies to be included	Evidence type	UK studies (other than RCTs)
Systematic reviews Randomised controlled trials	<u>Systematic reviews</u> Tricon 2006 <u>Randomised controlled trials</u> One trial reported in two papers: Peat 2004, Marks 2006	No corroborative evidence was found

First author Year	Research Question	Study populations	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
Tricon et al. 2006 UK SR 2+	To review the existing epidemiological evidence for an association between dietary intake (nutrients and food) and allergic diseases and to define the windows of opportunity for nutritional supplementation to be used as a preventative strategy for asthma and allergy.	Search strategy: Observational and intervention studies from 4 previous reviews (2000-2004) and more recent studies using PubMed and searching for the terms 'diet' 'asthma' 'allergy' 'atopy' in combination with 'vitamin' 'antioxidant' 'sodium' 'salt' 'magnesium' 'fruit' 'vegetable' 'selenium' or 'flavon' Many studies found but only 9 included children aged 2-5 y (1 RCT, 1 Cochrane review, 2 cohort, 1 intervention study, 2 cross-sectional and 2 case-control studies). RCT Bede 2003 Children age 4-16 y with mild to persistent bronchial asthma n=89 CAPS intervention study Mihrshahi 2003, Peat 2004	Results of studies were summarised by dietary factor as 'no' association, 'beneficial' association or 'harmful' association. Strong study characteristics received more weight in the interpretation of evidence. Strength of study was related to study design and whether studies controlled for nutritional and non-nutritional confounders. No quality grades given to individual studies. RCT Bede 2003 CAPS Intervention study: Mihrshahi 2003, Peat 2004	Bede 2003 12 week supplementation with 200/290 mg/day magnesium citrate vs. placebo (260 mg/day glucose) Assessment: bronchodilator use CAPS intervention study Mihrshahi 2003, Peat 2004 Int: supplementation with 500 mg tuna fish oil capsules containing 184 mg n-3 fatty acids, provision of oils and spreads low in n-6 and high in n-3 for use in food preparation Con: placebo supplementation with capsules containing 83% MUFA oils, provision of PUFA oils and margarines high in n-6 for use in food preparation Assessment: asthma, cough, wheeze, eczema, atopy to inhaled and ingested allergens Mihrshahi 2003 Follow-up at 18 months n=554 Loss to follow-up 10% Peat 2004 Follow-up at 3 y of age n=526 Loss to follow-up 15% Thien 2002 n-3 PUFA vs. placebo or untreated control	Bede 2003 Magnesium supplementation: beneficial association on bronchodilator use CAPS intervention study Mihrshahi 2003 n-3 PUFA supplementation: beneficial association with wheezing at 18 months of age Peat 2004 n-3 PUFA supplementation and n-6 fatty acid restriction: beneficial association with atopic cough at 3 years of age But no effect on the other endpoints measured at either age	The results are applicable to the UK The review made overall conclusions from studies in both adults and children. Funded by the EU sixth framework programme for research (FOOD-CT-2004-506378) More details of Peat 2004 were reported in the original paper. The original paper was data extracted for this RR and appears below, with details from a further CAPS publication (Marks et al 2006)

First auth or Year	Research Question	Study populations	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
		Unborn children at high risk of asthma n=616 Cochrane review Thien 2002 Searched for studies including adults or children >2 y with asthma Included nine RCTs published 1988-2000 In seven of the nine included studies there were no participants under 8 years old In one study (Dry 1991) age of participants was unspecified One study included children aged 4-17 (Nagakura 2000)	Cochrane review of RCTs Thien 2002		Cochrane review Thien 2002 n-3 PUFA supplementation: little evidence to recommend supplementation or modification of intake of n-3 PUFAs to improve asthma control, but no harmful effects if done so No consistent effect on FEV_1, peak flow rate, asthma symptoms, asthma medication use or bronchial hyper-reactivity. But one study in children (Nagakura 2000) showed improved peak flow and and reduced asthma medication.	

Author, Year, Country Design Quality	Research question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
Peat 2004 Australia RCT 1+	To measure the separate and combined effects of dietary supplementation with omega-3 fatty acids and/or house dust mite allergen avoidance in the primary prevention of allergic disease in children with a family history of asthma	Pregnant women whose unborn children were at high risk of developing asthma were recruited from the antenatal clinics of 6 hospitals in Sydney Inclusion At least one parent or sibling with current asthma or frequent wheeze, fluency in English, telephone at home, resident within 30km of recruitment centre Exclusion Pet cat at home, vegetarian diet, multiple births, birth at <36 weeks gestation 616 women randomised to four groups 6 children withdrawn immediately after birth for medical reasons Group A (n=149)	<u>Study quality</u> Power calculation: Expected prevalence of asthma in this cohort at age 5 years was 60%. It was estimated that 90 children in each of 4 groups would provide 80% power (α=0.05) to detect a difference of 15% between the control and intervention groups in separate 2x2 analyses assuming no interaction between interventions, and a difference of 20% between the groups in a single 4x2 analysis with an interaction between interventions	CAPS Study (Childhood Asthma Prevention Study) House dust mite intervention: All participants received advice on simple cleaning, vacuuming, dusting and maintaining adequate ventilation Intervention: In addition, given allergen-impermeable mattress covers, asked to avoid using sheepskin underlays or leaving soft toys in the child's bed, provided with a washable latex-free playmat to reduce contact with carpets, and asked to wash the child's bedding and playmat in an acaricidal detergent before birth and at 3-monthly intervals Diet intervention: 500mg tuna fish oil capsules containing ~184mg omega-3 fatty acids to add to child's food once daily from age 6 months, plus canola-based oils (low in omega-6 and high in omega-3 fatty acids) for use in all food preparation (No supplementation before 6 months if child breastfed but tuna fish oil added to formula if infant was formula-fed. Controls: Placebo supplement capsules (Sunola oil, Clover Corp)	Prevalence of respiratory and allergic outcomes by dietary intervention group at 3 years Intervention Placebo p value No asthma: 59.9% 58.3% 0.99 No cough: 50.6% 39.4% 0.03 No wheeze: 59.9% 58.3% 0.93 No eczema: 72.3% 68.7% 0.49 Atopy to ingested allergens: 8.0% 9.4% Atopy to inhaled allergens: 23.7% 29.7% House dust mite atopy: 19.5% 24.6% The absolute reduction of mild cough by diet was 7.1% and of moderate cough was 4.1% (p=0.03). However, when stratified by atopy, there was a significant 10% (95% CI 3.7 to 16.4) reduction in atopic cough (mild or moderate cough with at least 1 positive skin prick test) by diet (p=0.003; number needed to treat, 10) but a negligible 1.1% (95% CI -7.1 to 9.5) absolute reduction in nonatopic cough Prevalence of respiratory and allergic outcomes by house dust mite allergen avoidance group at 3 years are reported No significant interaction between the interventions was observed Overall, the researchers found that at age 3 years, the dietary intervention of omega-3 supplementation and omega-6 restriction significantly reduced atopic cough, and the allergen avoidance intervention reduced house mite atopy, but there was no effect of either intervention on wheeze	Appear applicable The interventions were designed to be used in simple public health campaigns Researchers state it will be important to assess further the long-term effects of the two interventions when the children are older and when asthma and allergic disease can be measured with more certainty Supported by the National Health and Medical Research Council of Australia, New South Wales Health Department, Children's Hospital at Westmead, and the Co-operative Research Centre for Asthma

Author, Year, Country Design Quality	Research question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
		Placebo diet supplements, no house dust mite reduction Group B (n=155) Placebo diet supplements, active house dust mite reduction Group C (n=159) Active diet supplements, no house dust mite reduction Group D (n=153) Active diet supplements, active house dust mite reduction Mean age (y): mothers 29, fathers 31 Australian born: mothers 73%, fathers 68% Tertiary educated: mothers 47%, fathers 45% Asthma: mothers 55%, fathers 40% Mother smoked in pregnancy 23% Male child 49.6% Older siblings 67% Breastfed at 1m 69%	Randomisation using Microsoft Excel to produce sequentially numbered sealed envelopes. Recruiting team blind to allocation until recruitment completed	containing 83% monounsaturated oils, provided with widely used oils and margarines high in omega-6 fatty acids for use in all food preparation Outcomes: symptoms of allergic disease and allergen sensitisation Follow-up 526/616 at 3 years (85%)		The CAPS Study was included in the review by Tricon et al (2006) Details of CAPS study publications reported by Tricon et al (2006) (Mihrsahi et al 2003, Peat et al 2004) appear in the evidence table for Tricon et al (2006) above

Author, Year, Country Design Quality	Research question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
Marks et al. 2006 Australia RCT 1+		These characteristics reported to be well balanced between the 4 groups Marks 2006 gave the study results at age 5 years		Follow-up 516/616 at 5 years (84%) Outcomes: asthma, eczema, skin prick tests for atopy	Prevalence of respiratory and allergic outcomes by dietary intervention group at 5 years Intervention n=267 / Placebo n=249 / p value / RR (95% CI) Probable current asthma: 23.2% / 20.5% / 0.5 / 1.13 (0.82-1.57) Cough without colds: 20.6% / 14.5% / 0.09 / 1.42 (0.97-2.09) No wheeze: 68.9% / 67.1% Current eczema: 20.3% / 24.0% / 0.4 / 0.85 (0.61-1.17) Any atopy: 42.9% / 46.2% / 0.5 / 0.93 (0.76-1.13) House dust mite atopy: 34.7% / 33.3% / 0.8 / 1.04 (0.81-1.33) n=203 / n=193 IgE, IU/L 68 / 79 / 0.3 / 0.86 (0.64-1.16) The prevalence of asthma, wheeze, eczema or atopy did not differ between the diet groups at age 5 years ($p>0.1$) The ratio of omega-6 to omega-3 fatty acids in plasma was lower in the active dietary intervention group (5.8 vs. 7.4; $p<0.0001$). The allergen avoidance intervention also had no effect on the prevalence of of asthma, wheeze or atopy ($p>0.1$) but the prevalenceof eczema was marginally higher in the allergen avoiding intervention group (26% vs. 19%, $p=0.06$).	

4 What is the effectiveness of interventions that aim to prevent diet-related dental caries, in pre-school children?

Studies to be included	Evidence type	UK studies (other than RCTs)
Systematic reviews Randomised controlled trials	<u>Systematic reviews</u> Burt 2006 SIGN 2005 <u>Randomised controlled trials</u> None were found	Corroborative evidence from three UK studies is presented in the text of the review Crawford 1999 McKeown 2003 Hackett 2003

First auth or Year	Research Question	Study populations	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
Burt 2006 US SR 2-	To examine evidence for the use 0f polyol-sweetened chewing gums in controlling dental caries amongst patients and the public in general.	Search strategy: Medline search using 'caries' and the names of various polyols as search terms. Only clinical trials and observational studies that examined caries outcome in groups of people. Hand searching of recent relevant journals and some older articles. Google search carried out also to find relevant websites The total no. of studies found was not given and included those in children and adults. Results were given in a narrative review under various headings. Only one of the included studies was of preschool children and published since 1990: Sorbitol No relevant studies Xylitol Autio 2002 Before-after study? In pre-school children	No details of study quality were given	Xylitol Autio 2002 Before-after study Pre-school children chewed xylitiol-sweetened gum 3 times/day for 3 weeks	Xylitol Autio 2002 Chewing xylitol-sweetened gum 3 times/day for 3 weeks significantly reduced salivary mutans streptococci counts	The results may be applicable to the UK The review made overall conclusions from studies in both adults and children. One study (Hildebrandt 2000) was stated to be in children but was found to be in adults. No details of funding given

Author, Year, Country, Design, Quality	Research Question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
SIGN[1] 2005 UK SR 2+	To provide guidelines for the prevention and management of dental decay in the pre-school child including those relating to dietary factors	Inclusion/exclusion criteria not supplied - apparently all relevant material including studies of adults and children. <u>Included studies relevant to NICE review (only those studies that were used to develop guidelines relevant to the 6-24 m and 2-5 y NICE reviews are described and results that apply to children aged 2-5 y</u>. Systematic reviews: Burt & Pai 2001, Lingstrom 2003, Reisine & Psoter 2001 RCTs: Gedalia 1994 Intervention studies: Brazilian children (Rodrigues & Sheiham 2000); Other studies: Gibson & Williams 1999 (large cohort study), Hallett 2002, a large US prospective study (Marshall 2003, Levy 2003)	Levels of evidence (1++ to 4 (expert opinion)) (very similar to NICE quality assessment) and grades of recommendation (A-D) were presented (see results. No other information on quality reported, except for the following: The Iowa study, Marshall 2003, Levy 2003, had a high level	Few details given of specific interventions in review. Additional information includes the following: Rodrigues & Sheiham 2000: conducted in 510 low socio-economic 3 year-old Brazilian children in nurseries with and without guidelines restricting sugar consumption Burt & Pai 2001: a systematic review of 36 observational studies Lingstrom 2003: a systematic review of 18 randomised or controlled clinical trials.	Guidelines were developed using studies of subjects of any age. Detailed data not provided in review, but summarised as follows: Specific study details given are provided for those studies thought to include children aged 2-5 y Guidelines given a grade B <u>Free sugars in food</u> • Children attending a nursery which restricted the consumption of sugar consumed lower amounts of sugar at lower frequencies and had a substantially lower risk of caries. RR for caries for those attending the unrestricted nurseries was 3.6. (graded 2++) (Rodrigues & Sheiham 2000) • The systematic review found a weak to moderate association between sugar consumption and dental caries, which was weaker in the presence of fluoridation. (2 studies strong; 16 moderate; 18 weak to no relationship between sugar consumption and caries. (graded 2+) (Burt & Pai 2001) Relevant guideline: Parents and carers should be advised that foods and confectionery containing free sugars should be minimised, and if possible, restricted to meal times. <u>Sugar substitutes – bulk sweeteners</u>, mostly polyols, e.g.xylitol • A systematic review of both chewing gums and sweets containing polyols found polyols were non-cariogenic, so they are a dentally safe substitute for sucrose in confectionery and other foods. There was insufficient evidence that polyols actively prevented caries. (2+) (Lingstrom 2003) Relevant guideline: Parents and carers should be advised that confectionery and beverages containing sugar substitutes are preferable to those containing sugars. Guidelines given a grade C	The Guidelines were directly applicable to the UK The guidelines were developed because pre-school children in Scotland have the highest rates of tooth decay in Europe. The intention is to consider the guidelines for review in 2008. The Brazilian study (Rodrigues & Sheiham 2002) adjusted for many confounders e.g. tooth brushing, fluoride use, home sugar consumption. The review acknowledged that chewing gum should not be

[1] SIGN is a collaborative network of clinicians, other healthcare professionals and patient organisations and is part of NHS Quality Improvement Scotland.

Author, Year, Country, Design, Quality	Research Question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
		Initial search for guidelines:Embase and Medline (1996-2003), the following websites: American Dental Association, Canadian Dental Association, Canadian Practice Guidelines Info Base, National Guidelines Clearinghouse, New Zealand Guidelines Group, National Health and Medical Research Council – Australia, Swedish Council on Technology Assessment in Health Care (SBU), UK Health Technology Assessment Programme and US Agency for Healthcare Research and Quality. Searches for systematic reviews, RCTs, meta-analyses and observational studies 1999-2004 on Embase, Medline and the Cochrane Library. Grey literature not included. Additional material from members of the group.	of attrition 67-85%	Marshall 2003, Levy 2003 US Iowa Fluoride study – cohort (n=642) followed from birth in an area with fluoridated water. Diet assessed at 1,2,3,4 and 5 years and caries at 4 and 7 years. High loss to follow-up: 1% at age 1 y; 8% at age 2 y; 31% at age 3 y; 36% at age 4 y; 35% at age 5 y – cumulatively 38% for 1 through 5 y. Hallett 2002 Cross-sectional Australian study of 3375 children (4-6 y old) Gibson & Williams 1999 Large National Diet and Nutrition cross-sectional survey - UK study of children aged 1.5-4.5 y (n=1450) Gedalia 1994 Non-RCT 179 Israeli schoolchildren aged 7-9 years Follow-up for 2 years	<u>Free sugars in fluids</u> The large US study (Marshall 2003, Levy 2003) found the strongest links with consumption in the 1st year: • Associations found with sugared drinks intake at age 1-4 y and dental caries at age 4-7 y. The highest risk was associated with sweetened drinks given in the first year. Milk had a neutral association with caries. (Marshall 2003).(2+) • Total water intake at age 1-4 y was highly protective against dental caries at age 4-7 y (Levy 2003). The authors noted this could be related to consumption of fluoridated water. Total non-water drinks consumption in the first year (including cow's milk) was the highest risk factor; while total water consumption was highly protective, suggesting that some of the adverse effect of sugary drinks may be because they reduce consumption of (fluoridated) water. (2+) • A large cross-sectional study of Australian children aged 4-6 y (graded 3) found an increased risk of early childhood caries (at <6 y of age) with (OR=4.29, CI 2.9-6.38) for sweetened bottle content, (OR=1.73, CI 1.49-2.0) for sleeping with a bottle, (1.58, CI 1.49-2.0) (Hallett 2002) This study did not adjust for confounding factors like social class or toothbrushing. • This effect was reduced in a large UK study (Gibson & Williams 1999) (3), which adjusted for social class and tooth brushing, where no risk was found to be associated with consumption of soft drinks but there was no specific reference to bottle use or adjustment for fluoride exposure.. Relevant guideline: Parents and carers should be advised that drinks containing free sugars, including natural fruit juices, should be avoided between meals. Water or milk may be given instead. <u>Other foodstuffs</u> • Three studies found evidence that cheese might be protective against caries (2++) (Gedalia 1994: the trial found a substantial protective benefit from hard cheese taken regularly but was of children aged 7-9 years) (The other 2 studies were conducted in	applicable to pre-school children but that chewable sweets would be applicable. The SIGN review suggests that the results of the Burt & Pai review 2001 should not give false reassurance about the role of sugars in dental caries.

Author, Year, Country, Design, Quality	Research Question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
					older children/adults.) • There was no clear evidence for the relevance of the consumption of other foods but whole fruit consumption did not appear to be cariogenic when eaten at normal levels. (3) Relevant guideline: Parents and carers should be advised that cheese is a good high energy food for toddlers as it is non-cariogenic and may be actively protective against caries. <u>Giving sweetened milk or juice in a bottle</u> <u>Breastfeeding beyond one year</u> Relevant results are presented in the 6-24 m review	

5 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?

Studies to be included	Evidence type	UK studies (other than RCTs)
Systematic reviews Randomised controlled trials	Systematic reviews None found Randomised controlled trials Shah 2003	No corroborative evidence was found

Iron rich foods and anaemia

Author, Year, Country Design Quality	Research question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
Shah 2003 Texas, US RCT 1-	To compare the effect of apple juice, vs. that of orange juice, on iron absorption in children consuming a meal	Children aged 3-6 years were recruited by public advertisement Inclusion: Between 5th and 95th weight-for-height percentiles, no underlying medical problems, no medications or vitamin supplements, would drink both apple juice and orange juice Exclusion: not stated 25 children recruited Characteristics reported for 21 who completed the study: M 11, F 10 White 14, Hispanic 5, African American 2 Age (y) 4.47±0.88 (3.08-5.89) Weight (kg) 16.66±1.48 (13.3-19.7)	<u>Study quality</u> Power calculation Expected iron absorption 8%±4%. Assuming the smallest clinically sig decrease to be 3%, a sample of 20 children was required for 80% power to detect such a difference, p<0.05. To allow for subject attrition 25 recruited. No ITT analysis. No other quality details given.	Cross-over RCT On 2 successive days, children consumed identical meals (toast, jam and non-citrus fruit) that included apple juice (ascorbic acid content 1 mg/100mL) on one day and orange juice (non-calcium fortified, ascorbic acid content 39 mg/100mL) on the other, in random order. The meals were labelled with iron-57 on one day and iron-58 on the other Iron absorption was measured from red blood cell incorporation of the iron stable isotopes 14 days later Follow-up at 14 days 21/25 (84%)	Median iron absorption from the meal ingested with apple juice was 7.17% (mean±SD, 9.48%±9.68%) Median iron absorption from the meal ingested with orange juice was 7.78% (9.80%±6.66%; p=0.44) Researchers conclude that as children absorbed iron well from a meal that includes either orange or apple juice, a preference for apple juice does not pose a concern with regard to the prospect of iron deficiency anaemia, which remains a significant health problem in the United States	Unclear Except for the test meals given on the first 2 study days, no other dietary intervention took place. The meals differed significantly in carbohydrate, protein, phosphate and ascorbic acid content , p=0.003-p<0.01 and also for Zn and Cu content .The iron content of the 2 meals did not differ, p=0.18. An insufficient amount of blood was obtained from 2 children on day 14 for analysis. Another 2 children did not return for the day 14 visit One child was mildly anaemic (hematocrit 33.4%, haemoglobin level 11.3g/dL).

		Height (cm) 104.5±5.1 (97.2-114.8) Hematocrit (%) 36.5±2 (33.4-40.4) Haemoglobin (g/dL) 12.2±0.5 (11.3-13.5) Serum ferritin (ng/mL) 27.7±15.5 (8.1-58.3) Serum transferrin receptor (mg/L) 6.5±1.1 (4.8-8.5)				Analyses were carried out both with and without this subject A relevant confounder would be the acidic nature of the fruit juices not related to vitamin C content. Funded by the US Department of Agriculture/ Agricultural Research Service, and by the State of Florida, Department of Citrus, Lakeland

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