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?

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 the 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.	<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.	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.	<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	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
		Del Tredici 1988 (CT) EFNEP Californian mothers n=663 (Int, n=355; Con, n=328)	Del Tredici 1988 (CT) moderate (no intervention control group/no weak ratings) i.e. 2+	Del Tredici 1988 Intervention: EFNEP Instruction over 6 months with mean no visits = 7.8, mean length = 80 min Instruction included: selecting and buying; cooking and preserving; and food safety No controls	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 1996 (RCT) EFNEP Virginian mothers n=150	Cox 1996 (RCT) moderate (weak on randomisation)	Cox 1996 Intervention: 18 EFNEP lessons given by a paraprofessional nutritionist: 2/week for 6 months	Cox (EFNEP) - increase from 1.5 to 2.6 servings/day of fruit in Int group vs. no change in controls $p<0.002$ - increase from 0.9 to 1.6 servings/day of vegetables in Int group vs 0.6	

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			i.e. 1+	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	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) i.e. 2+	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) i.e. 1+	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 interventions	Graves 1982/ Shannon 1982 (cohort) moderate (no weak ratings)	Graves 1982/Shannon 1982 Intervention for children: a 9-week curriculum, cafeteria posters and activity sheets Controls: usual health curriculum	<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) - increased knowledge, and improved attitude to eating nutritious foods	

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		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 or moderate, of which	i.e. 2+		and vegetables but not to eating new foods.	

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		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 with strong evaluation designs included with random assignment to control and treatment groups or strong quasi-experimental designs and with some evidence of instrument reliability and validity. Also studies with some evidence of reasonable design and measurement. Studies with limitations included if limitations 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	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	programme at school or at home 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 dieticians) worked with families (no other details) Koblinsky et al 1992 Newsletters and workshops for 13 weeks Int and Con groups	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		Assessment – pre-test, post-test, children's food intake <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	

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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	the intervention to have an effect 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.		Assessment – pre-test, post-test, food preferences 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 and Marlin 1980 Peer modelling, then follow-up at 6 weeks Assessment – pre-test, post-test,	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 and Marlin 1980 ▪ 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.	

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				food preferences **Birch et al 1980** 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	**Birch et al 1980** ▪ 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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				days Assessment – pre-test, post-test, 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)	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)	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	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.

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		Three studies of the 102 included in the SR were relevant to improving the diet of children aged 2-5 y (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)	Reich scores: Gutelius 1977 0.59 RCT moderate i.e. 1+ Gutelius 1977 (from original paper) Randomisation using random numbers. Barker 1988 0.46 RCT borderline i.e. 1-	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 assessment.	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 % 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 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.	Review funded via the Health Technology Assessment NHS R&D HTA Programme (UK).

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		and Barker 1994 (non-RCT), in Northern Ireland (public health and family development nurses (n=606: Int n= 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	Barker 1994 0.46 non-RCT borderline i.e. 1- Additional quality 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.	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	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	1. Using traditional teaching methods Byrd-Bredbenner 1993 (Healthy Start0 ▪ 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	.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.

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		14 studies included in review. All US studies but 1 in the UK (James 1992) <u>RCTs</u> 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, <u>range 4-7 y, n=60</u> <u>Before-after</u> 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 <u>Non-RCT</u> Koblinsky 1992 mothers of preschool children, n=171 <u>Cohort with comparison</u> Robert-Gray 1989 Pre-school children,	which are relevant to the UK population' were included. <u>RCTs</u> Byrd-Bredbenner 1993 poor/ moderate i.e.1- Possible bias as same teachers did teaching and evaluation, no details of selection of subset of children for evaluation Lawatsch 1990 moderate i.e.1+ Gorelick 1985 moderate i.e.1+ Did not pre-test control children Peterson 1984 moderate i.e. 1+ Essa 1988 moderate i.e.1+ Many study details missing Singleton 1992 moderate i.e.1+ <u>Before-after</u> Turner 1987	Gorelick 1985 California state University nutrition education kit. Preschool classes at different 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	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 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)	Birch 1987 gave very little detail of 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

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		54 child day care centres Experimental Birch 1984 Mean age 4.2, range 3-5 y, n=45 Birch 1987 Age 23-30 m, n=43 Participant characteristics 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	poor/moderate i.e. 1- lack of info on selection 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 i.e.1+ Before-after, no control group, no statistical analysis, possible bias as recruitment method unspecified Smith 1986 moderate/poor i.e.1- Non-RCT Koblinsky 1992 moderate i.e.1+ Interpretation difficult due to demographic differences between groups due to non-random	pre-schools. 4 groups: 2 groups computer-based intervention university n=18, community n=13; 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	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,	were participating in the WIC programme – 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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		1993, Koblinsky 1992, Smith 1986, James 1992); and 3 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	allocation process Cohort with comparison Robert-Gray 1989 poor i.e. 1- Experimental Birch 1984 moderate i.e.1+ Birch 1987 moderate i.e.1+	either 'look' (see and smell food) or 'taste' (see, smell and taste food). 30 day experimental 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	p<0.05 and p=0.02, respectively. 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	

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		papers Grey literature - sought from several sources. Language- English publications only		Children recruited from a university child development laboratory, parents and teachers 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	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 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
				relationship to food using open concept map questions and a score for closed questions. <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 dieticians. 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-	<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	

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				read nutrition newsletters and 4 workshops over 2 months (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. 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	intention to reduce sugar ($p<0.01$) and salt intake ($p<0.05$) only 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	

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				programme's Child Health & Disability Prevention Screening Forms (CHDP) used as a basis 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 dieticians 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	<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	

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				menu plans 2 weeks prior and 6 and 12 weeks after the workshop. Follow-up from 20 Int and 20 Con daycare centres		

Author, Year, Country Design Quality	Research question	Study population	Study quality	Intervention	Main results Only those reported by intervention group Effect size, CI	Applicability to UK populations and settings Comments Funding
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%)				

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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=437: 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 fat 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 at 8 and 13 months Fat intake in both I and C groups 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 13 months I (n=466) C (n=449) Fat as % energy 26.2 (6.0) 28.0 (5.0) <0.001 Intakes at 2 and 3 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 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 Intakes at 4 years of age: Fat intakes were lower in the I group (p<0.001 for fat, cholesterol, saturated and polyunsaturated fat) Other results are reported	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%)		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
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 (74 boys and 68 girls) and their principal care giver randomised to	Study quality 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 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 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

		Exposure (e) n = 50 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.		

Vitamin and micronutrient supplements

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

Food allergies and intolerance

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	<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	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

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		reasons Group A (n=149) 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%	between interventions 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%)		for Asthma

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		Older siblings 67% Breastfed at 1m 69% These characteristics reported to be well balanced between the 4 groups				

Dental Caries

First author, Year,	Research Question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments
SIGN[1] 2005 UK SR 2+		Inclusion/exclusion criteria not supplied - apparently all relevant material including studies of adults and children. Included studies (only those studies that were used to develop guidelines [relevant to this NICE review], and that apply to children aged 2 to 5 years are included in this table) Systematic reviews: Burt & Pai 2005, Lingstrom 2003, Reisine & Psoter 2001, Valaitis 2000 RCTs: Gedalia 1994 Intervention studies: (Rodrigues & Sheiham 2000); Other studies: Gibson & Williams 1999 (large cohort study), Hallett 2002, Mohan 1998, a large US prospective study (Marshall 2003, Levy 2003) Initial search for guidelines: Embase and Medline (1996-2003), the following websites: American Dental	Levels of evidence (1++ to 4 (expert opinion)) 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 of attrition 67-85%	Few details given of specific interventions in review. Additional information includes the following: Rodrigues & Sheiham 2000: conducted in Brazilian children in nurseries with and without guidelines restricting the sugar consumption Burt & Pai 2005: a systematic review of observational studies Gibson & Williams 1999: large NDNS UK study of children aged 1.5-4.5 y	Guidelines were developed using studies of subjects of any age. Some additional data from the original studies that are not reported in the SIGN document have been included in this table. Guidelines given a grade B Free sugars in food • 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. 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+ (Burt & Pai 2005) Relevant guideline: Parents and carers should be advised that foods and confectionary containing free sugars should be minimised, and if possible, restricted to meal times. Sugar substitutes – bulk sweeteners, 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 confectionary and other foods. There was insufficient evidence that polyols actively prevented caries. 2+ (LIngstrom 2003) Relevant guideline: Parents and carers should be advised that confectionary and beverages containing sugar substitutes are preferable to those containing sugars. Guidelines given a grade C Free sugars in fluids The large US study (Marshall 2003, Levy 2003) found the strongest links with consumption in the 1st year: • Total non-water drinks intake at age 1-4 y and total sugared beverage intake, especially fizzy drinks, was strongly associated	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 applicable to pre-

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

First author, Year,	Research Question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments
		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.			with dental caries at age 4-7 y (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 is likely to be because the water was fluoridated) 2+ Two studies found: • A high risk of colonisation by streptococci mutans or caries with having sweetened bottle contents (Mohan 1998, Hallett 2002) In a further UK study in children aged 1.5-4.5 y (NDNS, Gibson & Williams 1999), the effect of sugar consumption on caries was found to be reduced in children that brushed their teeth twice daily. The association of caries with sugar confectionery (both in amount and frequency) was only present among children whose teeth were brushed less than twice a day. 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 other two were conducted in older children/adults) • 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>Bottle feeding</u> • A high risk of colonisation by streptococci mutans with having sweetened bottle contents (Mohan 1998) • An increased risk of early childhood caries (OR=4.29, CI 2.9-6.38) sweetened bottle content, (OR=1.73, CI 1.49-2.0) sleeping with a bottle, (1.58, CI 1.49-2.0) (Hallett 2002, 2+) • A review (Reisine and Psoter 2001, 2+) found only weak evidence of an association of bottle contents with caries but the reviewers	school children but that chewable sweets would be applicable. The SIGN review suggests that the results of the Burt & Pai review 2005 should not give false reassurance about the role of sugars in dental caries.

First author, Year,	Research Question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments
					noted the very poor quality of most studies • The same review again based on poor quality studies found no evidence that duration of bottle use is not significantly related to caries risk Relevant guideline: Parents and careers should be advised that drinks containing free sugars, including natural fruit juices, should never be put in a feeding bottle	

Dental caries

Author, Year, Country, Design, Quality	Research Question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
SIGN[2] 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 including those for all ages</u> Systematic reviews: Burt & Pai 2005, 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) Initial search for	Levels of evidence (1++ to 4 (expert opinion)) 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 of attrition 67-85%	Few details given of specific interventions in review. Additional information includes the following: Rodrigues & Sheiham 2000: conducted in Brazilian children in nurseries with and without guidelines restricting sugar consumption Burt & Pai 2005: a systematic review of observational studies	Guidelines were developed using studies of subjects of any age. Detailed data not provided in review and some additional data has been added from the original studies. 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. 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+ (Burt & Pai 2005) 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 <u>Free sugars in fluids</u> The large US study (Marshall 2003, Levy 2003) found the strongest links with consumption in the 1st year: • Total non-water drinks intake at age 1-4 y, including milk, was	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

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Author, Year, Country, Design, Quality	Research Question	Study population	Study quality	Intervention	Main results	Applicability to UK populations and settings Comments Funding
		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		Gibson & Williams 1999: large NDNS UK study of children aged 1.5-4.5 1	strongly associated with dental caries at age 4-7 y (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.) 2+ One study found: • A high risk of mutans streptococci colonisation or caries associated with having sweetened bottle contents (Hallett 2002) 3 This effect was reduced in a further UK study (Gibson & Williams 1999), which adjusted for social class and tooth brushing, where no risk was associated with consumption of soft drinks but there was no specific reference to bottle use. 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 other 2 were conducted in 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> • Weak evidence that giving sweetened milk or juice in a bottle increases the risk of dental caries 2+ (Reisine and Psoter 2001) • Duration of bottle use is not significantly related to risk of dental caries Relevant guideline: Parents and careers should be advised that drinks containing free sugars, including natural fruit juices, should never be put in a feeding bottle	applicable to pre-school children but that chewable sweets would be applicable. The SIGN review suggests that the results of the Burt & Pai review 2005 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
		included. Additional material from members of the group.				

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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