Scientific Advisory Committee on Nutrition

‘Feeding young children aged 1 to 5 years’

Annexes

Annex 1: UK and international recommendations

Table A1.1. Statutory schemes in the UK to improve the dietary intakes of young children.

Statutory scheme	Description	UK countries
Healthy Start Scheme	Helps to encourage a healthy diet for pregnant women, babies and young children under age 4 from low-income households. From 2022, beneficiaries are offered a prepaid card that can be used to buy, or be put towards the cost of: • fresh, frozen or tinned fruit and vegetables • fresh, dried and tinned pulses • plain cows' milk and infant formula Healthy Start beneficiaries can also use their card to collect: • Healthy Start vitamins (A, C and D) for pregnancy and lactation • vitamin drops (vitamins A, C and D) suitable from birth to 4 years old	England, Wales, Northern Ireland
Nursery Milk Scheme	The scheme allows childcare settings to claim reimbursement for one-third of milk per day for children under the age of 5 who attend a registered early years setting for at least 2 hours per day. It is a universal scheme, and claims can be made in respect of all children attending childcare, regardless of the income of their parents or carers. The scheme allows reimbursement to be claimed for plain cows' milk for children over the age of 1, and an equivalent volume of infant formula suitable from birth, and based on cows' milk, can be claimed for babies under the age of 1.	England, Wales, Northern Ireland
School Fruit and Vegetable Scheme	Provides children in Key Stage 1 at state-funded primary schools with a free portion of fruit or vegetable every school day.	England

Milk and Healthy Snack Scheme	The Scottish Milk and Healthy Snack Scheme replaced the UK Nursery Milk Scheme in August 2021 and offers eligible Childcare Settings, including childminders, up-front funding for the provision of a serving of milk or a non-dairy alternative and a healthy snack of fruit or vegetables. The Scheme supports the provision of milk, non-dairy alternative and healthy snack for all pre-school age children who attend a registered setting for 2 hours or more per day. Through the Scheme, the Scottish Government seeks to improve health outcomes for children and young people by supporting improvement in children's health in the earliest years, embedding healthy eating habits that will be taken forward into adolescence and throughout adult life, which is crucial in tackling health inequalities and reducing obesity.	Scotland
Best Start Foods Scheme	Best Start Foods is a prepaid card that can be used in shops or online to buy healthy foods like milk or fruit if one of the following applies to you: • you’re pregnant • you have a child under 3 The amount on the prepaid card will change depending on the age of your child.	Scotland
Scottish Vitamins Scheme	The Scottish Government is providing free Vitamin D supplements to all breastfeeding mothers and children under three. Since April 2017, we have provided free Healthy Start vitamins to all pregnant women for the duration of their pregnancy.	Scotland

Table A1.2. Summary of international young child feeding recommendations

	European Food Safety Authority (EFSA)	Dietary Guidelines for Americans (DGA)	World Health Organization (WHO)	Nordic Nutrition Recommendations (NNR)	Health Canada
Source	Scientific Opinion on nutrient requirements and dietary intakes of infants and young children in the European Union Publications | EFSA (see other publications for recommendations on individual nutrients)	Dietary Guidelines for Americans, 2020-2025	Feeding and nutrition of infants and young children. Guidelines for the WHO European Region, with emphasis on the former Soviet countries (2003) Infant and young child feeding Healthy diet (2020)	Nordic Nutrition Recommendations 2012: Integrating nutrition and physical activity	Nutrition for Healthy Term Infants: Recommendations from six to 24 Months Health Canada Dietary Reference Intakes Tables
General healthy eating advice	EFSA reported that one European country showed that an optimized mixed diet for children aged 1 to 18 years is able to provide an adequate energy	From 12 months, follow a healthy dietary pattern across the lifespan to meet nutrient needs, help achieve a healthy body weight, and reduce the risk of chronic disease.	By the age of about 1 year, children can share the normal family diet and do not require specifically prepared foods. Recommendations for feeding infants and young children (6-23 months) include:	The NNR (2012) did not make general healthy eating recommendations but made separate recommendations for energy (from age 1 month), macronutrients (from age 6 months) and micronutrients (from	By one year of age, young children should be eating a variety of foods from the four food groups in Canada's Food Guide and begin to have a regular schedule of meals and snacks.

	European Food Safety Authority (EFSA)	Dietary Guidelines for Americans (DGA)	World Health Organization (WHO)	Nordic Nutrition Recommendations (NNR)	Health Canada
	and nutrient supply for these age groups, with the exception of vitamin D. Although dietary habits markedly differ within Member States, this can be taken as an example of a dietary pattern which can ensure a sufficient energy and nutrient supply in infants and young children.	From birth to 23 months, parents, caregivers, and guardians are encouraged to introduce foods across all the food groups, including items that fit within a family's preferences, cultural traditions, and budget. Children and adolescents (2-18 years old) are encouraged to follow the recommendations on the types of foods and beverages that make up a healthy dietary pattern. The nutrition considerations for the general U.S. population apply to children and	• from 6 months, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods, while continuing to breastfeed for up to 2 years • appropriate food diversity (at least five food groups per day) • appropriate frequency of meals: two to three times a day between 6 and 8 months, increasing to three to four times a day between 9 and 23 months, with nutritious snacks offered once or twice a day as desired.	age 0 months [vitamin D for example,]).	Whenever possible, they should share mealtimes and snack times with other members of the family.

	European Food Safety Authority (EFSA)	Dietary Guidelines for Americans (DGA)	World Health Organization (WHO)	Nordic Nutrition Recommendations (NNR)	Health Canada
		adolescents (2 to 18). For example, due to low intakes of food groups, the nutrients of public health concern—calcium, vitamin D, potassium, and dietary fiber—apply to these life stages as well.			
Salt intake	Sodium intakes that are considered safe and adequate for children are 1.1g per day between ages 1 to 3 years and 1.3g per day between ages 4 to 6 years.	The CDRR (Chronic Disease Risk Reduction Level) for sodium intake per day is: 2 to 3 years: 1200mg 4 to 5 years: 1500mg	Salt should not be added to complementary foods.	From 2 to 5 years of age, salt intake should be limited to about 3 to 4 grams per day.	Recommend that foods are prepared with little or no added salt. Sodium (mg per day) adequate intake: 1 to 3 years: 1000mg 4 to 5 years: 1200mg
Sugar intake	Intake of free and added sugars should be as low as possible.	From 2 years of age, calories per day from added sugars should be less than 10%.	Consumption of added sugar should be limited to about 10% of total energy, because a high intake may	Intake of added sugars should be kept below 10 E%.	Recommended that foods are prepared with little or no added sugar.

	European Food Safety Authority (EFSA)	Dietary Guidelines for Americans (DGA)	World Health Organization (WHO)	Nordic Nutrition Recommendations (NNR)	Health Canada
		Avoid foods and beverages with added sugars for those younger than age 2.	compromise micronutrient status. Sugars should not be added to complementary foods.		
Fat intake	Fat intake in infants, which is high during the breastfeeding period, can gradually be reduced in the second half of the first year of life from the start of the complementary feeding period up to three years of age: 40 E% in the 6 to 12-month period and 35 to 40 E% in the 2nd and 3rd year of life.	From 2 years of age, calories per day from saturated fats should be less than 10%.	During complementary feeding and until at least 2 years of age, a child's diet should not be too low or too high in fat. A fat intake providing around 30 to 40% total energy is thought to be prudent.	From 2 years of age, intake of saturated fatty acids should be limited to less than 10% energy.	Nutritious, higher-fat foods are an important source of energy for young children. Dietary fat restriction is not recommended for children younger than two years. Total fat (% energy) Acceptable Macronutrient Distribution Ranges (AMDR): 1 to 3 years: 30 to 40% 4 to 5 years: 25 to 35%

	European Food Safety Authority (EFSA)	Dietary Guidelines for Americans (DGA)	World Health Organization (WHO)	Nordic Nutrition Recommendations (NNR)	Health Canada
Fibre intake	A fibre intake of 2 g per MJ is considered adequate for normal laxation in children from the age of one year. The Panel proposed an AI of 10 g per day for children aged 12 to 48 months.	Daily nutritional goal for fibre intake: Age 2 to 3 years: 14g per day. Age 4 to 5 years: 20g per day for males 17g per day for females.	Foods used for complementary feeding should not in general contain as much fibre as the adult diet, because fibre can displace the energy-rich foods that children under 2 years of age need for growth.	From 2 years of age, a fibre intake corresponding to 2 to 3g per MJ is appropriate. From school age, the intake should gradually increase to reach the recommended adult level during adolescence.	Young children should be offered a variety of foods high in fibre each day. These foods include whole grain breads and cereals, vegetables and fruit, and meat alternatives such as beans and lentils. Total fibre (g per day) adequate intake (AI): Age 1 to 3 years: 19g Age 4 to 5 years: 25g
Breastfeeding or milk	It is justified to assume that exclusive breast-feeding by well-nourished mothers for six months can meet a healthy infant’s need for energy, protein and most vitamins and minerals	For about the first 6 months of life, exclusively feed infants human milk. Continue to feed infants human milk through at least the first year of life, and longer if desired.	All infants should be exclusively breastfed from birth to about 6 months of age and at least for the first 4 months of life. From 6 months of age, breast milk should be complemented with a	Exclusive breastfeeding is recommended until the infant is about 6 months old. From 6 months of age, gradual introduction of a diversified diet is recommended. Breast milk as part of the diet is recommended	Encourage continued breastfeeding or offering 500mL per day of homogenized (3.25% M.F.) cow milk. If an older infant is no longer breastfed, pasteurised, homogenised cow milk is recommended as the

	European Food Safety Authority (EFSA)	Dietary Guidelines for Americans (DGA)	World Health Organization (WHO)	Nordic Nutrition Recommendations (NNR)	Health Canada
			variety of adequate, safe and nutrient-dense foods. Breastfeeding should preferably continue beyond the first year of life and in populations with high rates of infection continued breastfeeding throughout the second year and longer is likely to benefit the infant. Unmodified cows' milk should not be used as a drink before 9 months but can be used in small quantities in the preparation of complementary foods from 6 to 9 months.	throughout the child's first year, and partial breastfeeding can be continued for as long as it suits the mother and child.	main milk source and can be introduced from nine to 12 months. Recommend limiting cow milk intake to no more than 750 mL per day. Before age 2 years, partly skimmed, 2% or 1% milk is not routinely recommended as a young child's main milk source. Skimmed milk is an inappropriate choice for children younger than two years.

	European Food Safety Authority (EFSA)	Dietary Guidelines for Americans (DGA)	World Health Organization (WHO)	Nordic Nutrition Recommendations (NNR)	Health Canada
			From age 9 to 12 months, cows' milk can be gradually introduced into the infants diet as a drink. The transition from breastfeeding and transitional foods to the normal family diet and cessation of breastfeeding should be gradual, allowing the child to return to the breast occasionally. By the second year, unadapted family foods are an appropriate complement to breastfeeding as the child takes increasing quantities of food.		
Other beverages	—	Sugar-sweetened beverages (for example, soda, fruit	Because of their inhibitory effect on iron absorption, all	The guiding value for daily intake of drinking fluids for	Advise limiting fruit juice and sweetened beverages.

	European Food Safety Authority (EFSA)	Dietary Guidelines for Americans (DGA)	World Health Organization (WHO)	Nordic Nutrition Recommendations (NNR)	Health Canada
		drinks, sports and energy drinks) are not necessary in the child or adolescent diet Beverages that contain no added sugars should be the primary choice for children and adolescents	types of tea (black, green and herbal) and coffee should be avoided until 24 months of age. After this age, tea should be avoided at meal times. Sugary, fizzy drinks are not recommended.	adults and children performing moderate physical activity and living under moderate temperate conditions is 1 to 1.5L of water.	Encourage offering water to satisfy thirst. Total water (litres per day) adequate intake: Age 1 to 3 years: 1.3L Age 4 to 5 years: 1.7L

References for Table A1.1

EFSA Panel on Dietetic Products, Nutrition and Allergies (2019) Dietary reference values for sodium. EFSA. 17(9):5778.

EFSA panel on Dietetic Products Nutrition and Allergies (2013) Scientific Opinion on nutrient requirements and dietary intakes of infants and young children in the European Union. EFSA. 11(10):3408.

European Food Safety Authority (EFSA) (2021) EFSA explains draft scientific opinion on a tolerable upper intake level for dietary sugars. p. 1-4.

Health Canada (2015) Nutrition for Healthy Term Infants: Recommendations from Six to 24 Months. Available from: Nutrition for Healthy Term Infants: Recommendations from Six to 24 Months - Canada.ca

Health Canada (2010) Dietary Reference Intakes. Available from: Dietary Reference Intakes Tables - Canada.ca

Nordic Council of Ministers (2012) Nordic nutrition recommendations 2012: integrating nutrition and physical activity. 5th ed. Copenhagen.

U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2020-2025. 9th Edition. December 2020. Available from: DietaryGuidelines.gov.

WHO (World Health Organisation) (2020) Healthy diet. Available from: Healthy diet (who.int)

WHO (World Health Organisation) (2021) Infant and young child feeding. Available from: [Infant and young child feeding (who.int)]()

WHO (World Health Organisation) (2000) Feeding and nutrition of infants and young children. Available from: [Feeding and nutrition of infants and young children (who.int)]()

Annex 2: Summary of methodology used in the Diet and Nutrition Survey of Infants and Young Children and the National Diet and Nutrition Survey rolling programme

1. The dietary data collection method for both the Diet and Nutrition Survey of Infants and Young Children (DNSIYC) and the National Diet and Nutrition Survey rolling programme (NDNS RP) was a 4-day diary. Parents or carers were asked to keep a detailed diary of all foods and drinks consumed by the child for 4 consecutive days. Quantities consumed were estimated using a combination of household measures and portion size photographs. Both surveys were designed to represent all days of the week equally.

2. A single blood sample was taken from each child with written consent of the parent or guardian. The proportion of children in this age group for whom a blood sample was obtained was relatively low so the cell sizes for blood analytes were much lower than for nutrient intakes. In NDNS blood samples were taken throughout the year while in DNSIYC blood samples were taken between February and August.

3. DNSIYC data were collected between January and August 2011 from 1275 children aged 12 to 18 months, part of a wider sample of children aged 4 to 18 months, designed to be representative of the UK population.

4. Each NDNS fieldwork year collects data on approximately 150 to 160 children aged 18 to 60 months as part of a wider annual sample of 500 children aged 18 months to 18 years designed to be representative of the UK population. For NDNS, estimates were based on fieldwork years 9 to 11 combined (2016/17 to 2018/19) for most analyses (macronutrient and micronutrient intakes, vegetables and fruit consumption and % contribution of food groups to energy intake). These were the most recent data available from NDNS at the time of the analysis informing this risk assessment. The decision to combine the most recent 3 years of data for analysis was informed by the need to maximise the cell sizes available, balanced with the need to use the most recent data and to avoid combining data over many years when there have been changes in intake over time.

5. The following analyses used NDNS data from years 1 to 11 (2008/09 to 2018/19):
   - total dietary energy intake and body weight data were derived from years 1 to 11 to increase cell sizes and allow presentation in single year age bands
   - data on blood indices of nutritional status were derived from NDNS years 1 to 11 as the numbers of blood samples available are much lower than for intake data
   - energy and nutrient intakes, and body weight by index of multiple deprivation (IMD) quintile were derived from years 1 to 11 as larger numbers were needed in order to split the data into quintiles
   - time trend analysis of macronutrient and micronutrient intake

- contributors to iron, zinc and vitamin A intake for children with intakes above the reference nutrient intake for all 3 micronutrients, in order to increase cell sizes enough to present results
- contributors to each of iron, zinc, vitamin A and energy intake for children with intakes below and above the lower reference nutrient intake for each micronutrients, in order to increase cell sizes sufficiently to present results.
- analyses of characteristics of children with intakes of iron, zinc or vitamin A below the lower reference nutrient intake (LRNI) value for these micronutrients, in order to increase cell sizes enough to present results

6. For the majority of analyses food consumption, nutrient intakes and nutritional status are presented in 3 age bands:
   - 12 to 18 months (DNSIYC data)
   - 18 to 47 months (NDNS – 1.5 to 3 years age group)
   - 48 to 60 months (NDNS – data extracted from the 4 to 10 years age group).

7. Exceptions to this are energy intakes and body weight analyses which were presented for 5 age bands:
   - 12 to 18 months
   - 18 to 23 months
   - 24 to 35 months
   - 36 to 47 months
   - 48 to 60 months

   and analyses on vitamin D intake by ethnic minority group and nutrient intakes by IMD quintiles which are presented for 18 to 60 months.

8. For vitamin D intake and status, data are presented by ethnic minority group (white or non-white) where available. Sample numbers were insufficient to analyse specific Black, Asian and other ethnic minority groups.

9. For analyses on IMD quintile, the upper and lower 10% confidence intervals around the mean for each estimate are included to indicate whether the differences between the quintiles are likely to be statistically significant.

Annex 3: Details of literature search

Table A3.1. Details of literature search of online databases

	Embase	Medline	Cochrane	Food Science Technology Abstracts	Scopus
Population	exp *child/	*Child, Preschool/	*Child, Preschool/	DE "CHILDREN"	
Population	child* or infant* or pre?school* or baby or babies or toddler* or month* or aged	child* or infant* or pre?school* or baby or babies or toddler* or month* or aged	child* or infant* or pre?school* or baby or babies or toddler* or month* or aged		child* or infant* or pre?school* or baby or babies or toddler* or month* or aged
Intervention				DE "DIET" OR DE "NUTRIENT REQUIREMENTS" OR DE "FUNCTIONAL FOODS" OR DE "INFANT FOODS" OR DE "NUTRIENTS"	

	Embase	Medline	Cochrane	Food Science Technology Abstracts	Scopus
Intervention	exp *feeding behavior/	*Feeding Behavior/	*Feeding Behavior/	DE "INFANT FEEDING PRACTICES" OR DE "BREAST FEEDING" OR DE "WEANING" OR DE "EATING HABITS" OR DE "FASTING" OR DE "FOOD NEOPHOBIA" OR DE "FOOD PORTIONS" OR DE "HEALTHY EATING" OR DE "SNACKING"	
Intervention	*meal/	exp *Meals/	exp *Meals/	DE "PROCESSED FOODS" OR DE "BREAKFAST" OR DE "DINNERS" OR DE "LUNCHES" OR DE "PREPARED MEALS" OR DE "READY MEALS" OR DE "SCHOOL MEALS"	
Intervention	diet* or fe?d* or wean* or eat* or food* or meal* or drink* or beverag*	diet* or fe?d* or wean* or eat* or food* or meal* or drink* or beverag*	diet* or fe?d* or wean* or eat* or food* or meal* or drink* or beverag*	DE "BEVERAGES"	diet* or fe?d* or wean* or eat* or food* or meal* or drink* or beverag*

	Embase	Medline	Cochrane	Food Science Technology Abstracts	Scopus
				DE "MACRONUTRIENTS"	
Intervention	macro?nutrient* or micro?nutrient*	macro?nutrient* or micro?nutrient*	macro?nutrient* or micro?nutrient*		macro?nutrient* or micro?nutrient*
Intervention				DE "MICRONUTRIENTS" OR DE "MICRONUTRIENT STATUS"	
Intervention	exp *carbohydrate intake/	exp *Dietary Carbohydrates/	exp *Dietary Carbohydrates/	DE "CARBOHYDRATES"	

	Embase	Medline	Cochrane	Food Science Technology Abstracts	Scopus
Intervention	exp *fat intake/	exp *Dietary Fats/	exp *Dietary Fats/	DE "FATS" OR DE "COOKING FATS" OR DE "FAT SUBSTITUTES" OR DE "FATS ANIMAL" OR DE "FATS HIGH DIET" OR DE "FATS LOW DIET" OR DE "FATS LOW FOODS" OR DE "FATS VEGETABLE" OR DE "POLYUNSATURATED FATS" OR DE "SATURATED FATS" OR DE "SHORTENINGS" OR DE "UNSATURATED FATS"	

	Embase	Medline	Cochrane	Food Science Technology Abstracts	Scopus
Intervention	*protein intake/	exp *dietary proteins/	exp *dietary proteins/	DE "PROTEINS HIGH DIET" OR DE "PROTEINS HIGH FOODS" OR DE "PROTEINS LOW DIET" OR DE "PROTEINS VEGETABLE" OR DE "PROTEIN PRODUCTS"	
Intervention	protein or carbohydrate* or fat* or "omega 3"	protein or carbohydrate* or fat* or "omega 3"	protein or carbohydrate* or fat* or "omega 3"	"omega 3"	protein or carbohydrate* or fat* or "omega 3"
Intervention	*vitamin intake/	*Vitamin D/	*Vitamin D/		
Intervention				DE "VITAMIN D" OR DE "VITAMIN D STATUS"	
Intervention	*iron intake/	*Iron, Dietary/	*Iron, Dietary/	DE "IRON DEFICIENCY" OR DE "IRON STATUS" OR DE "ANAEMIA"	
Intervention	"vitamin A" or "vitamin D" or vitamins or an?emia	"vitamin A" or "vitamin D" or vitamins or an?emia	"vitamin A" or "vitamin D" or vitamins or an?emia		"vitamin A" or "vitamin D" or vitamins or anaemia

	Embase	Medline	Cochrane	Food Science Technology Abstracts	Scopus
	iron adj4 (intake or diet* or defficien*)	iron adj4 (intake or diet* or defficien*)	iron adj4 (intake or diet* or defficien*)		iron w/4 (intake or diet* or defficien*)
Intervention	exp *vegetarian diet/	exp *Vegetarians/	Diet, Vegetarian	DE "VEGETARIAN DIET" OR DE "VEGAN DIET" OR DE "VEGAN FOODS" OR DE "VEGETARIAN FOODS"	
Intervention	*vegan diet/			DE "GLUTEN LOW DIET" OR DE "GLUTEN LOW FOODS"	
Intervention	gluten?free or dairy?free or vegetarian* or vegan*	gluten?free or dairy?free or vegetarian* or vegan*	gluten?free or dairy?free or vegetarian* or vegan*		gluten?free or dairy?free or vegetarian* or vegan*
Intervention	exp *child nutrition/	exp *Infant Nutritional Physiological Phenomena/	exp *Infant Nutritional Physiological Phenomena/		
Outcomes	exp *body composition/	exp *Body Composition/		DE "BODY COMPOSITION" OR DE "BODY FAT DISTRIBUTION"	

	Embase	Medline	Cochrane	Food Science Technology Abstracts	Scopus
Outcomes	exp *child growth/	exp *Growth/		DE "GROWTH (HUMAN)"	
Outcomes	*childhood obesity/	*Pediatric Obesity/		DE "OBESITY"	
Outcomes	exp *childhood cancer/				
Outcomes	growth or $weight or obes* BMI or "body composition" or mass or diabetes or CHD or "coronary heart disease" or bone* or $skeletal or teeth or dental or oral or height or cancer* or allerg* or auto?immune or neurolog* or outcome*	growth or $weight or obes* BMI or "body composition" or mass or diabetes or CHD or "coronary heart disease" or bone* or $skeletal or teeth or dental or oral or height or cancer* or allerg* or auto?immune or neurolog* or outcome*		$weight or BMI or mass or diabetes or CHD or "coronary heart disease" or bone* or $skeletal or teeth or dental or oral or height or cancer* or allerg* or auto?immune or neurolog* or outcome*	growth or $weight or obes* BMI or "body composition" or mass or diabetes or CHD or "coronary heart disease" or bone* or $skeletal or teeth or dental or oral or height or cancer* or allerg* or auto?immune or neurolog* or outcome*
Cohort studies	"Born in Bradford"	"Born in Bradford"		"Born in Bradford"	"Born in Bradford"
Cohort studies	"Millenium Cohort Study"	"Millenium Cohort Study"		"Millenium Cohort Study"	"Millenium Cohort Study"

	Embase	Medline	Cochrane	Food Science Technology Abstracts	Scopus
Cohort studies	"Avon Longitudinal Study of Parents and Children"	"Avon Longitudinal Study of Parents and Children"		"Avon Study of Parents and Children"	"Avon Study of Parents and Children"
Cohort studies	"Southampton Women's Survey"	"Southampton Women's Survey"		"Avon Longitudinal Study of Parents and Children"	"Avon Longitudinal Study of Parents and Children"
Cohort studies	"Generation R"	"Generation R"		"Generation R"	"Generation R"
Cohort studies	"Feeding Infants and Toddlers Study"	"Feeding Infants and Toddlers Study"		"Feeding Infants and Toddlers Study"	"Feeding Infants and Toddlers Study"
Publication type	exp SYSTEMATIC REVIEW/				
Publication type	exp META ANALYSIS/				
Publication type	"review*" OR meta-analys* OR "meta analys*"	"review*" OR meta-analys* OR "meta analys*"	*Apply SR filter*	"review*" OR meta-analys* OR "meta analys*"	"review*" OR meta-analys* OR "meta analys*"
Date limit	1990-current	1990-current	1990-current	1990-current	1990-current

Table A3.2. Details of supplementary literature search on oral health

	Embase
Population	exp *child/ child* or infant* or pre?school* or baby or babies or toddler* or month* or aged
Dietary exposures	exp *feeding behavior/ exp *Breast Feeding/ exp *child nutrition/ diet* or $fe?d* or eat* or food* or meal* or bottle or cup or "food pouch*"
Dietary exposures	sugar/ exp oligosaccharide/ sugar* or "free sugar" or NMES or “non?milk extrinsic sugars” or sweet* or sucrose or fructose or lactose or galactose or maltose or isomaltose or monosaccharides or oligosaccharides or disaccharides
Dietary exposures	milk/
Dietary exposures	exp *sweetened beverage/
Dietary exposures	carbonated beverage/
Dietary exposures	smoothie* or juice* or milk or formula
Dietary exposures	(sweet* or sugar* or acid* or soft or probiotic or cariogenic or soda or carbonated) adj3 (drink* or beverage*)
Dietary exposures	honey or raisin* or sultana* or prune* or fruit* or yog?urt or cake* or biscuit* or confectionary or syrup* or cookie* or snack* or vegetable* sweet* or chocolate*

Dental health outcomes	dental health/ (dental or oral) adj health tooth disease/ exp dental caries/ "childhood dental caries"
Dental health outcomes	(dental or tooth or teeth or enamel or dentin or rampant or recur*) adj3 (decay* or cavit* or caries or carious or "white spot*" or plaque or $minerali*)
Dental health outcomes	dmf index/
Dental health outcomes	decay?missing?fill* or "decayed and filled tooth" or "decayed extracted filled surface" or "International Caries Classification and Management System"
Dental health outcomes	malocclusion/ exp periodontal disease/ "peridontal disease" or malocclusion
Cohort studies	"Born in Bradford" "Millenium Cohort Study" "Avon Longitudinal Study of Parents and Children" "Southampton Women's Survey" "Generation R" "Feeding Infants and Toddlers Study"

Annex 4: Selection of studies

Table A4.1. References excluded based on assessment of full-text articles (1st and 2nd screenings)

Reference	Reason for exclusion
1st screening	
Aburto NJ, Ziolkovska A, Hooper L, Elliott P, Cappuccio FP, Meerpohl JJ (2013) Effect of lower sodium intake on health: systematic review and meta-analyses. BMJ. 346:f1326	Population
Agrawal S, Berggren KL, Marks E, Fox JH (2017) Impact of high iron intake on cognition and neurodegeneration in humans and in animal models: a systematic review. Nutr Rev. 75(6):456-470.	Population
Alazmah A (2017) Early Childhood Caries: A Review. J Contemp Dent Pract. 18(8):732-737.	Study type (not a systematic review)
Al Khalifah, Alsheikh R, Alhelali N, Naji A, Alnasser Y (2018) The impact of vitamin D fortification of staple food for children: A systematic review and meta-analysis. Endocr Rev. 39 (2 supp 1)	Study type (not a systematic review)
André HP, Sperandio N, Siqueira RL, Franceschini SDCC, Priore SE (2018) Food and nutrition insecurity indicators associated with iron deficiency anemia in Brazilian children: a systematic review. Cien Saude Colet. 23(4):1159-1167	Country

Reference	Reason for exclusion
Arora A, Schwarz E, Blinkhorn AS (2011) Risk factors for early childhood caries in disadvantaged populations. J Investig Clin Dent. 2(4):223-8.	Study type (not a systematic review)
Ash T, Agaronov A, Young T, Aftosmes-Tobio A, Davison KK (2017) Family-based childhood obesity prevention interventions: a systematic review and quantitative content analysis. Int J Behav Nutr Phys Act. 14(1):113.	Intervention or exposure
Avery A, Anderson C, McCullough F (2017) Associations between children's diet quality and watching television during meal or snack consumption: A systematic review. Matern Child Nutr.13(4):e12428	Intervention or exposure
Avery A, Bostock L, McCullough F (2015) A systematic review investigating interventions that can help reduce consumption of sugar-sweetened beverages in children leading to changes in body fatness. J Hum Nutr Diet. 28 Suppl 1(Suppl 1):52-64.	Population
Bánóczy J, Rugg-Gunn AJ (2007) Caries prevention through the fluoridation of milk. A review. Fogorv Sz. 100(5):185-192, 177-84.	Study type (not a systematic review)
Barba G, Russo P (2006) Dairy foods, dietary calcium and obesity: a short review of the evidence. Nutr Metab Cardiovasc Dis. 16(6):445-51	Study type (not a systematic review)

Reference	Reason for exclusion
Bazzano A N, Kaji A, Felker-Kantor E, Bazzano L A, Potts K S (2017) Qualitative Studies of Infant and Young Child Feeding in Lower-Income Countries: A Systematic Review and Synthesis of Dietary Patterns. Nutrients. 9(10):1140.	Country
Bello S, Meremikwu MM, Ejemot-Nwadiaro RI, Oduwole O (2016) Routine vitamin A supplementation for the prevention of blindness due to measles infection in children. Cochrane Database Syst Rev. (8)	Country
Best C, Neufingerl N, Del Rosso JM, Transler C, van den Briel T, Osendarp S (2011) Can multi-micronutrient food fortification improve the micronutrient status, growth, health, and cognition of schoolchildren? A systematic review. Nutr Rev. 69(4):186-204.	Population
Bizarra F, De Castro, (2013) Update in oral health prevention in the early childhood: Review. Aten Primaria. 157	Study type (not a systematic review)
Bluford DA, Sherry B, Scanlon KS (2007) Interventions to prevent or treat obesity in preschool children: a review of evaluated programs. Obesity (Silver Spring). 15(6):1356-72.	Intervention or exposure
Brion MA, Ness AR, Davey Smith G, Leary SD (2007) Association between body composition and blood pressure in a contemporary cohort of 9-year-old children. J Hum Hypertens. 21(4):283-90.	Study type (not a systematic review)

Reference	Reason for exclusion
Cagetti MG, Campus G, Milia E, Lingström P (2013) A systematic review on fluoridated food in caries prevention. Acta Odontol Scand. 71(3-4):381-7.	Intervention or exposure
Callejo D, Díaz-Cuervo H, Cuervo J, Rebollo P, Hussain A, Hitman GA (2013) Early Life Determinants of Metabolic Syndrome and Diabetes Mellitus in South Asian Population Living in Europe: A Systematic Review. Value Health. 16(7):A434-5.	Study type (not a systematic review)
Cameron AJ, Spence AC, Laws R, Hesketh KD, Lioret S, Campbell KJ (2015) A Review of the Relationship Between Socioeconomic Position and the Early-Life Predictors of Obesity. Curr Obes Rep. 4(3):350-62.	Intervention or exposure
Campbell K, Crawford D (2001) Family food environments as determinants of preschool-aged children's eating behaviours: implications for obesity prevention policy. A review. Aust J Nutr Diet. 58(1):19-25.	Study type (not a systematic review)
Campbell K, Peebles R (2014) Eating disorders in children and adolescents: state of the art review. Pediatrics. 134(3):582-92.	Intervention or exposure
Campbell K, Waters E, O'Meara S, Summerbell C (2001) Interventions for preventing obesity in childhood. A systematic review. Obes Rev. 2(3):149-57.	Intervention or exposure

Reference	Reason for exclusion
Campbell KJ, Hesketh KD (2007) Strategies which aim to positively impact on weight, physical activity, diet and sedentary behaviours in children from zero to five years. A systematic review of the literature. Obes Rev. 8(4):327-38.	Intervention or exposure
Caroli A, Poli A, Ricotta D, Banfi G, Cocchi D (2011) Invited review: Dairy intake and bone health: a viewpoint from the state of the art. J Dairy Sci. 94(11):5249-62.	Study type (not a systematic review)
Chen H, Zhuo Q, Yuan W, Wang J, Wu T (2008) Vitamin A for preventing acute lower respiratory tract infections in children up to seven years of age. Cochrane Database Syst Rev. (1)	Intervention or exposure
Cheng YS, Tseng PT, Chen YW, Stubbs B, Yang WC, Chen TY, Wu CK, Lin PY (2017) Supplementation of omega 3 fatty acids may improve hyperactivity, lethargy, and stereotypy in children with autism spectrum disorders: a meta-analysis of randomized controlled trials. Neuropsychiatr Dis Treat. 13:2531-2543.	Population
Chi DL, Luu M, Chu F. A scoping review of epidemiologic risk factors for pediatric obesity: Implications for future childhood obesity and dental caries prevention research. J Public Health Dent. 2017 Jun;77 Suppl 1:S8-S31.	Population
Choi J, Joseph L, Pilote L (2013) Obesity and C-reactive protein in various populations: a systematic review and meta-analysis. Obes Rev. 14(3):232-44	Intervention or exposure

Reference	Reason for exclusion
Ciampa PJ, Kumar D, Barkin SL, Sanders LM, Yin HS, Perrin EM, Rothman RL (2010) Interventions aimed at decreasing obesity in children younger than 2 years: a systematic review. Arch Pediatr Adolesc Med. 164(12):1098-104.	Intervention or exposure
Clark EM, Ness AR, Tobias JH (2008) Vigorous physical activity increases fracture risk in children irrespective of bone mass: a prospective study of the independent risk factors for fractures in healthy children. J Bone Miner Res. 23(7):1012-22.	Intervention or exposure
Conway, S (2012) Vitamin K & CF: Review of current knowledge. Pediatr Pulmonol. 35.194-195.	Study type (not a systematic review)
Cortese S, Moreira-Maia CR, St Fleur D, Morcillo-Peñalver C, Rohde LA, Faraone SV (2016) Association Between ADHD and Obesity: A Systematic Review and Meta-Analysis. Am J Psychiatry. 173(1):34-43.	Intervention or exposure
Coughlin SS, Smith SA (2017) Community-Based Participatory Research to Promote Healthy Diet and Nutrition and Prevent and Control Obesity Among African-Americans: a Literature Review. J Racial Ethn Health Disparities. 4(2):259-268.	Intervention or exposure
Coull J, James D, Young J (2015) A systematic review of the literature focusing on preschool nutrition in low socioeconomic and ethnic minorities. Matern Child Nutr. 11 (Suppl S2) 125-126.	Intervention or exposure

Reference	Reason for exclusion
Cox D, Hendrie G, Carty D (2016) Sensitivity, hedonics and preferences for basic tastes and fat amongst adults and children of differing weight status: a comprehensive review. Food Quality and Preference 48: 359-367.	Age (review did not specifically search for studies conducted in young children)
Dal Maso L, Bosetti C, La Vecchia C, Franceschi S (2009) Risk factors for thyroid cancer: an epidemiological review focused on nutritional factors. Cancer Causes Control. 20(1):75-86.	Population
Dallacker M, Hertwig R, Mata J (2018) The frequency of family meals and nutritional health in children: a meta-analysis. Obes Rev. 19(5):638-653.	Intervention or exposure
Darling AL, Wynter D, Torgerson DJ, Hewitt CE, Millward DJ, Lanham-New SA, Manders RJ (2017) The influence of dietary protein intake on bone health and fracture risk across the lifespan: a systematic review and meta-analysis. Proc Nutr Soc. 76(OCE2)	Study type (not a systematic review)
Das JK, Kumar R, Salam RA, Bhutta ZA (2013) Systematic review of zinc fortification trials. Ann Nutr Metab. 62 Suppl 1:44-56.	Population
De Craemer M, De Decker E, De Bourdeaudhuij I, Vereecken C, Deforche B, Manios Y, Cardon G; ToyBox-study group (2012) Correlates of energy balance-related behaviours in preschool children: a systematic review. Obes Rev. 13 Suppl 1:13-28	Population

Reference	Reason for exclusion
Deng X, Venarske D, Hartman T, Hartert TV (2007) Reviewing the impact of diet on asthma and allergy, part 1. J Respir Dis. 28(10):448-59.	Study type (not a systematic review)
De-Regil LM, Jefferds MED, Peña-Rosas JP (2017) Point-of-use fortification of foods with micronutrient powders containing iron in children of preschool and school-age. Cochrane Database Syst Rev. (11)	Country
De-Regil LM, Suchdev PS, Vist GE, Walleser S, Peña-Rosas JP (2013). Home fortification of foods with multiple micronutrient powders for health and nutrition in children under two years of age (Review). Evid Based Child Health. 8(1):112-201.	Country
Diep CS, Chen TA, Davies VF, Baranowski JC, Baranowski T (2014) Influence of behavioral theory on fruit and vegetable intervention effectiveness among children: a meta-analysis. J Nutr Educ Behav. 46(6):506-46.	Intervention or exposure
Dougkas A, Barr S, Reddy S, Summerbell C D (2018) A critical review of the role of milk and dairy products in the development of obesity in children and adolescents. Obes Facts (11 Supp 1). 194	Study type (not a systematic review)
Eggersdorfer M (2017) α-Tocopherol–a systematic review of intake and status globally. FASEB J. 31 1 Supp 1.	Study type (not a systematic review)

Reference	Reason for exclusion
Ekweagwu E, Agwu AE, Madukwe E (2008) The role of micronutrients in child health: A review of the literature. Afr J Biotechnol. 7(21).	Study type (not a systematic review)
Faith MS, Carnell S, Kral TV (2013) Genetics of food intake self-regulation in childhood: literature review and research opportunities. Hum Hered. 75:80-9.	Study type (not a systematic review)
Forshee RA, Anderson PA, Storey ML (2008) Sugar-sweetened beverages and body mass index in children and adolescents: a meta-analysis. Am J Clin Nutr. 87(6):1662-71.	Population
Friend AJ, Craig LC, Turner SW (2012) The prevalence of metabolic syndrome in children–a systematic review. Arch Dis Child. 1. A116-A117	Study type (not a systematic review)
Gastrich MD, Bachmann G, Wien M (2007) A review of recent studies from 1986 to 2006 assessing the impact of additive sugar in the diet. Top Clin Nutr. 22(2):137-55.	Study type (not a systematic review)
Gera T, Sachdev HP, Nestel P, Sachdev SS (2007) Effect of iron supplementation on haemoglobin response in children: systematic review of randomised controlled trials. J Pediatr Gastroenterol Nutr. 44(4):468-86.	Published before the publication cutoff date for consideration of evidence in the SACN report 'Iron and Health' (March 2010)
Ghanchi A, James P (2018) Guts, germs and iron: a systematic review of the effect of iron supplementation and fortification on diarrhoea in children aged 4 to 59 months. Arch Dis Child. 103 (supp 1):A121-A122	Study type (not a systematic review)

Reference	Reason for exclusion
Gibson LJ, Peto J, Warren JM, dos Santos Silva I (2006) Lack of evidence on diets for obesity for children: a systematic review. Int J Epidemiol. 35(6):1544-52.	Population
Gibson RS, Anderson VP (2009) A review of interventions based on dietary diversification or modification strategies with the potential to enhance intakes of total and absorbable zinc. Food Nutr Bull. 30(1 Suppl):S108-43.	Intervention or exposure
Golding J, Emmett P, Iles-Caven Y, Steer C, Lingam R (2014) A review of environmental contributions to childhood motor skills. J Child Neurol. 29(11):1531-47.	Intervention or exposure
Grammatikaki E, Wollgast J, Caldeira S (2018) Review of food based dietary guidelines for infants and young children and subsequent evaluation of processed cereal based food and baby food currently in the market. Obes Facts. 11 (supp 1) 183.	Study type (not a systematic review)
Haslam DE, McKeown NM, Herman MA, Lichtenstein AH, Dashti HS (2018) Interactions between Genetics and Sugar-Sweetened Beverage Consumption on Health Outcomes: A Review of Gene-Diet Interaction Studies. Front Endocrinol (Lausanne). 8:368.	Population
Huang CM, Lara-Corrales I, Pope E (2018) Effects of Vitamin D levels and supplementation on atopic dermatitis: A systematic review. Pediatr Dermatol. 35(6):754-760.	Population (clinical)

Reference	Reason for exclusion
Hawkins SS, Law C (2006) A review of risk factors for overweight in preschool children: a policy perspective. Int J Pediatr Obes. 1(4):195-209.	Study type (not a systematic review)
Hayden C, Bowler JO, Chambers S, Freeman R, Humphris G, Richards D and Cecil JE (2013) Obesity and dental caries in children: a systematic review and meta-analysis. Community Dent Oral Epidemiol. 41(4):289-308.	Study type (not a systematic review)
Herrmann SD, McMurray RG, Kim Y, Willis EA, Kang M, McCurdy T (2017) The influence of physical characteristics on the resting energy expenditure of youth: A meta-analysis. Am J Hum Biol. 29(3)	Intervention or exposure
Hesketh KD, Campbell KJ (2010) Interventions to prevent obesity in 0-5 year olds: an updated systematic review of the literature. Obesity (Silver Spring). 18 Suppl 1:S27-35.	Intervention or exposure
Hillier-Brown FC, Bambra CL, Cairns JM, Kasim A, Moore HJ, Summerbell CD (2014) A systematic review of the effectiveness of individual, community and societal level interventions at reducing socioeconomic inequalities in obesity amongst children. BMC Public Health. 14:834.	Intervention or exposure
Ho M, Garnett SP, Baur L, Burrows T, Stewart L, Neve M, Collins C (2012) Effectiveness of lifestyle interventions in child obesity: systematic review with meta-analysis. Obes Res Clin Prac. 1. 54-55.	Study type (not a systematic review)

Reference	Reason for exclusion
Ho M, Garnett SP, Baur L, Burrows T, Stewart L, Neve M, Collins C (2012) Effectiveness of lifestyle interventions in child obesity: systematic review with meta-analysis. Pediatrics. 130(6):e1647-71.	Intervention or exposure
Hobbs M, Pearson N, Foster PJ, Biddle SJ (2015) Sedentary behaviour and diet across the lifespan: an updated systematic review. Br J Sports Med. 49(18):1179-88.	Intervention or exposure
Hoyland A, Dye L, Lawton CL (2009) A systematic review of the effect of breakfast on the cognitive performance of children and adolescents. Nutr Res Rev. 22(2):220-43.	Population
Huncharek M, Muscat J, Kupelnick B (2008) Impact of dairy products and dietary calcium on bone-mineral content in children: results of a meta-analysis. Bone. 43(2):312-321.	Population
Iguacel Azorin I, Miguel-Berges ML, Gomez-Bruton A, Moreno LA, Julian Almarcegui C (2017) Veganism, vegetarianism and bone mineral density: A systematic review and meta-analysis. Ann Nutr Metab. 71 (Supp 2):333	Study type (not a systematic review)
Iheozor-Ejiofor Z, Worthington HV, Walsh T, O'Malley L, Clarkson JE, Macey R, Alam R, Tugwell P, Welch V, et al. (2015) Water fluoridation for the prevention of dental caries. Cochrane Database Syst Rev. 2015(6):CD010856.	Intervention (outside scope)

Reference	Reason for exclusion
Janakiram C, Deepan Kumar CV, Joseph J (2017) Xylitol in preventing dental caries: a systematic review and meta-analyses. J Nat Sci Biol Med. 8(1):16-21.	Intervention
Ji X, Grandner MA, Liu J (2017) The relationship between micronutrient status and sleep patterns: a systematic review. Public Health Nutr. 20(4):687-701.	Population
Jolliffe DA, Greenberg L, Hooper RL, Griffiths CJ, Camargo CA Jr, Kerley CP, Jensen ME, Mauger D, Stelmach I, Urashima M, Martineau AR (2017) Vitamin D supplementation to prevent asthma exacerbations: a systematic review and meta-analysis of individual participant data. Lancet Respir Med. 5(11):881-890.	Population (clinical)
Julián-Almárcegui C, Gómez-Cabello A, Huybrechts I, González-Agüero A, Kaufman JM, Casajús JA, Vicente-Rodríguez G (2015) Combined effects of interaction between physical activity and nutrition on bone health in children and adolescents: a systematic review. Nutr Rev. 73(3):127-39.	Population
Kairey L, Matvienko-Sikar K, Kelly C, McKinley M C, O'Connor E M, Kearney P M, Woodside J V, Harrington J M (2018) Portion size in parents' eyes: A mixed methods systematic review of parental portioning practices for their children. Obes Facts. 11 (Supp 1). 202.	Study type (not a systematic review)

Reference	Reason for exclusion
Kamath CC, Vickers KS, Ehrlich A, McGovern L, Johnson J, Singhal V, Paulo R, Hettinger A, Erwin PJ, Montori VM (2008) Clinical review: behavioral interventions to prevent childhood obesity: a systematic review and metaanalyses of randomized trials. J Clin Endocrinol Metab. 93(12):4606-15.	Intervention or exposure
Kattelmann K, Doddivenaka C (2011) A review of various parental aspects influencing food intake and weight status in children. Top Clin Nutr. 26(2):96-103.	Intervention or exposure
Katz J, Bimstein E (2011) Pediatric obesity and periodontal disease: a systematic review of the literature. Quintessence Int. b42(7):595-9.	Population (age)
Kim YH, Kim, KW, Kim, MJ, Sol, IS, Yoon SH, Ahn HS, Kim HJ, Sohn, M H and Kim KE. (2016) Vitamin D levels in allergic rhinitis: a systematic review and meta-analysis. Pediatr Allergy Immunol. 27(6):580-90	Population (age)
Kolokotroni O, Middleton N, Kouta C, Raftopoulos V, Yiallouros PK (2015) Association of Serum Vitamin D with Asthma and Atopy in Childhood: Review of Epidemiological Observational Studies. Mini Rev Med Chem. 15(11):881-99.	Intervention or exposure
Kosmeri C, Siomou E, Vlahos AP and Milionis H. (2018) Review shows that lipid disorders are associated with endothelial but not renal dysfunction in children. Acta Paediatr. 108(1):19-27.	Intervention (clinical)

Reference	Reason for exclusion
Kowash MB (2014) Early childhood caries - A continuing oral health problem: A review. Applied Clinical Research, Clinical Trials and Regulatory Affairs. 1(2): 111-117	Study type (not a systematic review)
Krebs NF, Miller LV, Hambidge KM (2014) Zinc deficiency in infants and children: a review of its complex and synergistic interactions. Paediatr Int Child Health. 34(4):279-88.	Study type (not a systematic review)
Kremmyda LS, Vlachava M, Noakes PS, Diaper ND, Miles EA, Calder PC (2011) Atopy risk in infants and children in relation to early exposure to fish, oily fish, or long-chain omega-3 fatty acids: a systematic review. Clin Rev Allergy Immunol. 41(1):36-66.	Study type (not a systematic review)
Kristjansson E, Francis DK, Liberato S, Benkhalti Jandu M, Welch V, Batal M, Greenhalgh T, Rader T, Noonan E, Shea B, Janzen L, Wells GA, Petticrew M (2015) Food supplementation for improving the physical and psychosocial health of socio-economically disadvantaged children aged three months to five years. Cochrane Database Syst Rev. (3)	Country
Kuratko C, Cernkovich BE, Nelson E, Salem N (2013) The relationship of docosahexaenoic acid (DHA) with learning and behaviour in healthy children: a review. Nutrients. 5(7):2777-810.	Population (age)

Reference	Reason for exclusion
Lam LF, Lawlis TR (2017) Feeding the brain - The effects of micronutrient interventions on cognitive performance among school-aged children: A systematic review of randomized controlled trials. Clin Nutr. 36(4):1007-1014	Population
Lam LF, Lawlis T (2017) The effects of micronutrient interventions on cognitive performance among school-aged children: A systematic review of RCTs. J Nutr Intermed Metab. 8:107-8.	Study type (not a systematic review)
Larson LM, Yousafzai AK (2017). A meta-analysis of nutrition interventions on mental development of children under-two in low- and middle-income countries. Matern Child Nutr. 13(1)	Country
Lassi ZS, Moin A, Bhutta ZA (2016) Zinc supplementation for the prevention of pneumonia in children aged 2 months to 59 months. Cochrane Database Syst Rev. 12(12)	Country
Laws R, Campbell KJ, van der Pligt P, Russell G, Ball K, Lynch J, Crawford D, Taylor R, Askew D, Denney-Wilson E (2014) The impact of interventions to prevent obesity or improve obesity related behaviours in children (0-5 years) from socioeconomically disadvantaged and/or indigenous families: a systematic review. BMC Public Health. 14:779.	Intervention or exposure
Layton S, Engel B (2018) The influence of nutrition and gastrointestinal function in children with Autism Spectrum Disorder: a systematic review. J Hum Nutr Diet. 31 (Supp S1) 9-10	Study type (not a systematic review)

Reference	Reason for exclusion
Lerch C, Meissner T (2007) Interventions for the prevention of nutritional rickets in term born children. Cochrane Database Syst Rev. (4)	Study type (not a systematic review)
Lewis KA, Brown SA (2017) Searching for Evidence of an Anti-Inflammatory Diet in Children: A Systematic Review of Randomized Controlled Trials for Pediatric Obesity Interventions With a Focus on Leptin, Ghrelin, and Adiponectin. Biol Res Nurs. 19(5):511-530.	Intervention or exposure
Li YJ, Li YM, Xiang DX (2018) Supplement intervention associated with nutritional deficiencies in autism spectrum disorders: a systematic review. Eur J Nutr. 57(7):2571-2582.	Population
Lindsay AC, Mesa T, Greaney M (2016) Maternal Depressive Symptoms and Child Feeding Practices in Young Children: A Systematic Review of the Literature. FASEB J. 30.	Study type (not a systematic review)
Lindsay AC, Sitthisongkram S, Greaney ML, Wallington SF, Ruengdej P (2017) Non-Responsive Feeding Practices, Unhealthy Eating Behaviors, and Risk of Child Overweight and Obesity in Southeast Asia: A Systematic Review. Int J Environ Res Public Health. 14(4):436.	Country
Ling J, Robbins LB, Wen F (2016) Interventions to prevent and manage overweight or obesity in preschool children: A systematic review. Int J Nurs Stud. 53:270-89.	Intervention or exposure

Reference	Reason for exclusion
Liu C, Lu M, Xia X, Wang J, Wan Y, He L, Li M (2015) Correlation of Serum Vitamin D Level with Type 1 Diabetes Mellitus in Children: A Meta-Analysis. Nutr Hosp. 32(4):1591-4.	Population
Lynch RJ (2013) The primary and mixed dentition, post-eruptive enamel maturation and dental caries: a review. Int Dent J. 63 Suppl 2:3-13	Study type (not a systematic review)
Lynch S, Stoltzfus R, Rawat R (2007) Critical review of strategies to prevent and control iron deficiency in children. Food Nutr Bull. 28(4 Suppl):S610-20.	Study type (not a systematic review)
Manikam L, Dharmaratnam A, Robinson A, Prasad A, Kuah JY, Stephenso L, et al. (2016) Infant and young children complementary feeding practices in South Asian families: a systematic review. Lancet. 388:S74	Study type (not a systematic review)
Manios Y, Androutsos O, Katsarou C, De, Bourdeaudhuij, Koletzko B, Moreno L, Summerbell C, Iotova V, Socha P, Lobstein T (2013) Early prevention of childhood obesity: Review of the literature and the first results of the toybox-study. Ann Nutr Metab. 1. 64-65	Study type (not a systematic review)
Mann J, Mallard, S (2013) Dietary sugars and body weight: Systematic review and meta-analyses of randomised controlled trials. FASEB J. 27.	Study type (not a systematic review)
Marti LF (2014) Dietary interventions in children with autism spectrum disorders - an updated review of the research evidence. Curr Clin Pharmacol. 9(4):335-49.	Intervention or exposure

Reference	Reason for exclusion
Matvienko-Sikar K, Toomey E, Delaney L, Harrington J, Byrne M, Kearney PM; Choosing Healthy Eating for Infant Health (CHErIsH) study team (2018) Effects of healthcare professional delivered early feeding interventions on feeding practices and dietary intake: A systematic review. Appetite. 123:56-71.	Intervention or exposure
Matwiejczyk L, Mehta K, Scott J, Tonkin E, Coveney J (2018) Characteristics of Effective Interventions Promoting Healthy Eating for Pre-Schoolers in Childcare Settings: An Umbrella Review. Nutrients. 10(3):293	Intervention or exposure
Mayo-Wilson E, Imdad A, Junior J, Dean S and Bhutta Z A (2014) Preventive zinc supplementation for children, and the effect of additional iron: a systematic review and meta-analysis. BMJ Open. 4(6):e004647.	Duplication of a Cochrane Review
McCarthy EK, Kiely M (2015) Vitamin D and muscle strength throughout the life course: a review of epidemiological and intervention studies. J Hum Nutr Diet. 28(6):636-45.	Population
McClain AD, Chappuis C, Nguyen-Rodriguez ST, Yaroch AL, Spruijt-Metz D (2009) Psychosocial correlates of eating behavior in children and adolescents: a review. Int J Behav Nutr Phys Act. 6:54.	Intervention or exposure
McCullough MB, Robson SM, Stark LJ (2016) A Review of the Structural Characteristics of Family Meals with Children in the United States. Adv Nutr. 7(4):627-40	Country

Reference	Reason for exclusion
Miceli Sopo S, Arena R, Greco M, Bergamini M, Monaco S (2014) Constipation and cow's milk allergy: a review of the literature. Int Arch Allergy Immunol. 164(1):40-5.	Intervention or exposure
Mogensen G, Rowland I, Midtvedt T, Fonden, R (2000) Functional Aspects of Pro-and Prebiotics A literature review on immune modulation and influence on cancer. Microb Ecol Health Dis. 12(supp2):40-44.	Study type (not a systematic review)
Moran VH, Stammers AL, Medina MW, Patel S, Dykes F, Souverein OW, Dullemeijer C, Pérez-Rodrigo C, Serra-Majem L, Nissensohn M, Lowe NM (2012) The relationship between zinc intake and serum/plasma zinc concentration in children: a systematic review and dose-response meta-analysis. Nutrients. 4(8):841-58.	Intervention or exposure
Moroshko I, Brennan L (2011) Parental feeding and the pre-schooler diet and weight: A systematic literature review. Obes Res Clin Prac. 71	Study type (not a systematic review)
Murphy JM (2007) Breakfast and learning: an updated review. Curr Nutr Food Sci. 3(1):3-6.	Study type (not a systematic review)
Narbutyte I, Narbutyte A, Linkeviciene L (2013) Relationship between breastfeeding, bottle-feeding and development of malocclusion. Stomatologija. 15(3):67-72.	Study type (not a systematic review)
Nehring I, Kostka T, von Kries R, Rehfuess EA (2015) Impacts of in utero and early infant taste experiences on later taste acceptance: a systematic review. J Nutr, 145(6), pp.1271-9.	Population (age)
Nelson AM (2012) A comprehensive review of evidence and current recommendations related to pacifier usage. J Pediatr Nurs. 27(6):690-9.	Intervention or exposure

Reference	Reason for exclusion
Nissensohn M, Fuentes Lugo D, Serra-Majem L (2018) Sugar-sweetened beverage consumption and obesity in children's meta-analyses: reaching wrong answers for right questions. Nutr Hosp. 35(2):474-488.	Population
Ochoa A, Berge JM (2017) Home Environmental Influences on Childhood Obesity in the Latino Population: A Decade Review of Literature. J Immigr Minor Health. 19(2):430-447.	Population
Okasha M, McCarron P, Gunnell D, Smith GD (2003) Exposures in childhood, adolescence and early adulthood and breast cancer risk: a systematic review of the literature. Breast Cancer Res Treat. 78(2):223-76.	Intervention or exposure
Orchard TS, Pan X, Cheek F, Ing SW, Jackson RD (2012) A systematic review of omega-3 fatty acids and osteoporosis. Br J Nutr. 107 Suppl 2(0 2):S253-60.	Population
Ortiz, Calderon SL, Arroyave, Zuleta LF, Gonzalez-Zapata LI. (2017) Free sugars and excess weight in children and adolescents from Latin America: A systematic review. Ann Nutr Metab. 71 (Supp 2) 813.	Study type (not a systematic review)
Pallavi SK, Rajkumar GC (2012) Soft drinks and oral health-A review. Indian J Pub Health Res Dev. 3 (4) 138-141.	Study type (not a systematic review)
Papandreou D, Malindretos P, Karabouta Z, Rousso I (2010) Possible Health Implications and Low Vitamin D Status during Childhood and Adolescence: An Updated Mini Review. Int J Endocrinol. 472173.	Study type (not a systematic review)

Reference	Reason for exclusion
Pate RR, O'Neill JR, Liese AD, Janz KF, Granberg EM, Colabianchi N, Harsha DW, Condrasky MM, O'Neil PM, Lau EY, Taverno Ross SE (2013) Factors associated with development of excessive fatness in children and adolescents: a review of prospective studies. Obes Rev. 14(8):645-58.	Population
Piekkala A, Kaila M, Virtanen S, Luukkainen P (2017) The effects of the elimination diet on the growth of a child with cow's milk allergy-systematic review. Eur J Allergy Clin Immun. 72 (Supp 2) 813.	Study type (not a systematic review)
Pinard CA, Yaroch AL, Hart MH, Serrano EL, McFerren MM, Estabrooks PA (2012) Measures of the home environment related to childhood obesity: a systematic review. Public Health Nutr. 15(1):97-109.	Intervention or exposure
Pinquart M (2014) Associations of general parenting and parent-child relationship with pediatric obesity: a meta-analysis. J Pediatr Psychol. 39(4):381-93.	Population
Quadros TMB, Gordia AP, Silva LR (2017) Anthropometry and Clustered Cardiometabolic Risk Factors in Young People: A Systematic Review. Rev Paul Pediatr. 35(3):340-350.	Population
Redsell SA, Edmonds B, Swift JA, Siriwardena AN, Weng S, Nathan D, Glazebrook C (2016) Systematic review of randomised controlled trials of interventions that aim to reduce the risk, either directly or indirectly, of overweight and obesity in infancy and early childhood. Matern Child Nutr. 12(1):24-38.	Intervention or exposure
Renzaho AM, Halliday JA, Nowson C (2011) Vitamin D, obesity, and obesity-related chronic disease among ethnic minorities: a systematic review. Nutrition. 27(9):868-79.	Population

Reference	Reason for exclusion
Rietmeijer-Mentink M, Paulis WD, van Middelkoop M, Bindels PJ, van der Wouden JC (2013) Difference between parental perception and actual weight status of children: a systematic review. Matern Child Nutr. 9(1):3-22.	Intervention or exposure
Riverin BD, Maguire JL, Li P (2015) Vitamin D Supplementation for Childhood Asthma: A Systematic Review and Meta-Analysis. PLoS One. 10(8):e0136841	Population
Roberts JL, Stein AD (2017) The Impact of Nutritional Interventions on Linear Growth After 2 y of Life: a Systematic Review and Meta-Analysis of Controlled Trials. FASEB J. 31(1 Supp 1).	Study type (not a systematic review)
Roohani N, Hurrell R, Kelishadi R, Schulin R (2013) Zinc and its importance for human health: An integrative review. J Res Med Sci. 18(2):144-57.	Study type (not a systematic review)
Rowlands AV, Ingledew DK, Eston RG (2000) The effect of type of physical activity measure on the relationship between body fatness and habitual physical activity in children: a meta-analysis. Ann Hum Biol. 27(5):479-97.	Intervention or exposure
Ruxton CH (2014) The suitability of caffeinated drinks for children: a systematic review of randomised controlled trials, observational studies and expert panel guidelines. J Hum Nutr Diet. 27(4):342-57.	Population
Ryan AS, Astwood JD, Gautier S, Kuratko CN, Nelson EB, Salem N Jr (2010) Effects of long-chain polyunsaturated fatty acid supplementation on neurodevelopment in childhood: a review of human studies. Prostaglandins Leukot Essent Fatty Acids. 82(4-6):305-14.	Study type (not a systematic review)

Reference	Reason for exclusion
Rycroft, C. E., Evans, C. E. L. and Cade, J. E (2016) A systematic review of childhood and adolescent cohorts which measure whole diet and subsequent adiposity. J Epidemiol Community Health. 70 Suppl 1:A81	Population
Rycroft CE, Evans CE, Cade JE (2017) Family meals to fast food: findings from a systematic review of childhood and adolescent cohorts which measure whole diet and subsequent adiposity. Proc Nutr Soc. 76(OCE4) E172.	Study type (not a systematic review)
Sachdev HPS, Gera T and Nestel P (2005) Effect of iron supplementation on mental and motor development in children: Systematic review of randomised controlled trials. Public Health Nutr. 8(2):117-32.	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Iron and Health’ (March 2010)
Sachdev H, Gera T, Nestel P (2006) Effect of iron supplementation on physical growth in children: systematic review of randomised controlled trials. Public Health Nutr. 9(7):904-920.	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Iron and Health’ (March 2010)
Sadeghirad B, Duhaney T, Motaghipisheh S, Campbell NR, Johnston BC (2016) Influence of unhealthy food and beverage marketing on children's dietary intake and preference: a systematic review and meta-analysis of randomized trials. Obes Rev. 17(10):945-59.	Intervention or exposure
Shapiro M, Downs S, Quelhas D, Kreis K, Kraemer K, West K, Fanzo J (2017) A systematic review examining the relationship between animal source food intake and growth in children 6 to 60 months in low-and middle-income countries. Ann Nutr Metab. 71 (Supp 2). 1213.	Study type (not a systematic review)

Reference	Reason for exclusion
Showell NN, Fawole O, Segal J, Wilson RF, Cheskin LJ, Bleich SN, Wu Y, Lau B, Wang Y (2013) A systematic review of home-based childhood obesity prevention studies. Pediatrics. 132(1):e193-200.	Intervention or exposure
Sioen I, van Lieshout L, Eilander A, Fleith M, Lohner S, Szommer A, Petisca C, Eussen S, Forsyth S, Calder P C, Campoy C, Mensink R P (2017) Systematic Review on N-3 and N-6 Polyunsaturated Fatty Acid Intake in European Countries in Light of the Current Recommendations – Focus on Specific Population Groups. Ann Nutr Metab. 70(1):39-50.	Intervention or exposure (a review of European population intakes of n3 and n6 polyunsaturated fatty acids)
Skouteris H, Fraser J, McCabe M, Ricciardelli LA, Milgrom J, Baur LA (2011) The influence of paternal parenting styles, cognitions, and behaviors on children's weight gain: A systematic review of the literature. Obes. 1. S150.	Study type (not a systematic review)
Sonntag D, Schneider S, Mdege N, Ali S, Schmidt B (2015) Beyond Food Promotion: A Systematic Review on the Influence of the Food Industry on Obesity-Related Dietary Behaviour among Children. Nutrients. 7(10):8565-76.	Intervention or exposure
Stacey FG, Finch M, Wolfenden L, Grady A, Jessop K, Wedesweiler T, Bartlem K, Jones J, Sutherland R, Vandevijvere S, Wu JH, Yoong SL (2017) Evidence of the potential effectiveness of centre-based childcare policies and practices on child diet and physical activity: consolidating evidence from systematic reviews of intervention trials and observational studies. Curr Nutr Rep. 6(3):228-46.	Study type (not a systematic review)
Stallings VA (1997) Calcium and bone health in children: a review. Am J Ther. 4(7-8):259-73.	Study type (not a systematic review)

Reference	Reason for exclusion
Suliga E (2009) Visceral adipose tissue in children and adolescents: a review. Nutr Res Rev. 22(2):137-47	Study type (not a systematic review)
Szajewska H, Ruszczynski M (2010) Systematic review demonstrating that breakfast consumption influences body weight outcomes in children and adolescents in Europe. Crit Rev Food Sci Nutr. 50(2):113-9.	Population
Szajewska H (2011) The role of meta-analysis in the evaluation of the effects of early nutrition on mental and motor development in children. Am J Clin Nutr. 94(6 Suppl):1889S-1895S.	Study type (not a systematic review)
Taylor CM, Wernimont SM, Northstone K, Emmett PM (2015) Picky/fussy eating in children: Review of definitions, assessment, prevalence and dietary intakes. Appetite. 95:349-59.	Study type (not a systematic review)
Theodoratou E, Tzoulaki I, Zgaga L and Ioannidis JP (2014) Vitamin D and multiple health outcomes: umbrella review of systematic reviews and meta-analyses of observational studies and randomised trials. BMJ. 348:g2035	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Vitamin D and Health’ (March 2016)
Toomey E, Delaney L, Harrington J, Byrne M, Kearney PM (2017) Effects of early infant feeding interventions on parental feeding practices: A systematic review. Obes Facts. 10 (Supp 1) 232-233.	Study type (not a systematic review)
Tseng PT, Cheng YS, Chen YW, Stubbs B, Whiteley P, Carvalho AF, et al. (2018) Peripheral iron levels in children with autism spectrum disorders vs controls: a systematic review and meta-analysis. Nutr Res. 50:44-52.	Population (clinical)

Reference	Reason for exclusion
Tubert-Jeannin S, Auclair C, Amsallem E, Tramini P, Gerbaud L, Ruffieux C, et al. (2011) Fluoride supplements (tablets, drops, lozenges or chewing gums) for preventing dental caries in children. Cochrane Database Syst Rev. 2011(12):CD007592.	Intervention (outside scope)
Vadiakas G. Case definition, aetiology and risk assessment of early childhood caries (ECC): a revisited review. Eur Arch Paediatr Dent. 2008 Sep;9(3):114-25.	Study type (not a systematic review)
Vargas-Garcia EJ, Evans CE, Cade JE (2016) Decreasing sugar-sweetened beverage intake in children: a systematic review and meta-analysis. Proc Nutr Soc. 75 (OCE3).	Study type (not a systematic review)
Vargas-Garcia EJ, Evans CE, Cade JE (2016) Improving consumption of sugar-sweetened beverages across populations: lessons learnt from a systematic review and meta-analysis. J Epid Comm Health. 70 (Suppl 1) A34-A35.	Study type (not a systematic review)
Voortman T, Van Den, Hooven EH, Vitezova A, Leermakers ETM, Sedaghat S, Buitrago-Lopez A, Sajjad A, Bautista PK, Ars CL, Tharner A, Bramer WM, Hofman A, Felix JF, Franco OH (2013) Effects of protein intake on cardiometabolic health in children: A systematic review. Ann Nutr Metab. 1. 578.	Study type (not a systematic review)
Vučić VM, Hermoso M, Arsić AČ, Vollhardt C, Bel-Serrat S, Gurinović MA, Roman-Vinas B, Koletzko B (2011) Effect of iron intervention on growth in infants, children and adolescents: a systematic review. Ann Nutr Metab. 3. 142-3.	Study type (not a systematic review)

Reference	Reason for exclusion
Vuichard Gysin D, Dao D, Gysin CM, Lytvyn L, Loeb M (2016) Effect of Vitamin D3 Supplementation on Respiratory Tract Infections in Healthy Individuals: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. PLoS One. 11(9):e0162996.	Population
Wadhera D, Capaldi-Phillips ED (2014) A review of visual cues associated with food on food acceptance and consumption. Eat Behav. 15(1):132-43.	Intervention or exposure
Wadhwa S, Sharma DS, Mehta M, Thakur D, Mahajan S, Singh SK, Satija S (2018) Vitamin D deficiency, skin, and sunshine: A review. Int J Green Pharm. 12(2):S345	Study type (not a systematic review)
Wang Y, Cai L, Wu Y, Wilson RF, Weston C, Fawole O, Bleich SN, Cheskin LJ, Showell NN, Lau BD, Chiu DT, Zhang A, Segal J (2015) What childhood obesity prevention programmes work? A systematic review and meta-analysis. Obes Rev. 16(7):547-65.	Intervention or exposure
Wang T, Shan L, Du L, Feng J, Xu Z, Staal W, Jia F (2016) Serum concentration of 25-hydroxyvitamin D in autism spectrum disorder: a systematic review and meta-analysis. Eur Child Adolesc Psychiatry. 25(4):341-50.	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Vitamin D and Health’ (March 2016)
Wang B, Zhan S, Gong T and Lee L (2013) Iron therapy for improving psychomotor development and cognitive function in children under the age of three with iron deficiency anaemia. Cochrane Database Syst Rev. 2013(6):CD001444.	Population (clinical)

Reference	Reason for exclusion
Ward S, Bélanger M, Donovan D, Carrier N (2015) Childcare educators' influence on physical activity and eating behaviours of preschool children: A systematic review. Canadian J Diab. 39 (Supp 1):S73.	Study type (not a systematic review)
Warthon-Medina M, Dillon S, Hall, Moran, Stammers AL, Qualter P, Nissensohn M, Serra, Majem, Lowe, NM (2013) The relationship between zinc intake and indices of cognitive function: A systematic review and meta-analyses. Proc Nutr Soc. 72(OCE4) E210.	Study type (not a systematic review)
Wilks DC, Mander AP, Jebb SA, Thompson SG, Sharp SJ, Turner RM, Lindroos AK (2011) Dietary energy density and adiposity: employing bias adjustments in a meta-analysis of prospective studies. BMC Public Health. 11:48.	Study type (not a systematic review)
Williams PG (2014) The benefits of breakfast cereal consumption: a systematic review of the evidence base. Adv Nutr. 5(5):636S-673S.	Population
Willits E, Joshi A, Motosue M, Patel B, Jin J, Kumar S, Bhagia A (2016) Vitamin D deficiency and its association with food allergies in children: systematic review and meta-analysis. Ann Allergy Asthma Immunol. 117(5):S10-1.	Study type (not a systematic review)
Willits EK, Wang Z, Jin J, Patel B, Motosue M, Bhagia A, Almasri J, Erwin PJ, Kumar S, Joshi AY (2017) Vitamin D and food allergies in children: A systematic review and meta-analysis. Allergy Asthma Proc. 38(3):21-28.	Study type (abstract only)
Winzenberg TM, Powell S, Shaw KA, Jones G (2010) Vitamin D supplementation for improving bone mineral density in children. Cochrane Database Syst Rev.10:CD006944	Published before the publication cutoff date for consideration of evidence in the SACN report 'Vitamin D and Health' (March 2016)

Reference	Reason for exclusion
Winzenberg TM, Powell S, Shaw KA, Jones G (2011) Effects of vitamin D supplementation on bone density in healthy children: systematic review and meta-analysis. BMJ. 342:c7254.	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Vitamin D and Health’ (March 2016)
Wiseman EM, Bar-El Dadon S, Reifen R (2017) The vicious cycle of vitamin a deficiency: A review. Crit Rev Food Sci Nutr. 57(17):3703-3714.	Study type (not a systematic review)
Xiao L, Xing C, Yang Z, Xu S, Wang M, Du H, Liu K, Huang Z (2015) Vitamin D supplementation for the prevention of childhood acute respiratory infections: a systematic review of randomised controlled trials. Br J Nutr. 114(7):1026-34.	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Vitamin D and Health’ (March 2016)
Yakoob MY and Lo CW (2017) Nutrition (Micronutrients) in Child Growth and Development: A Systematic Review on Current Evidence, Recommendations and Opportunities for Further Research. J Dev Behav Pediatr. 38(8):665-679.	Study type (not a systematic review)
Yakoob MY, Salam RA, Khan FR, Bhutta ZA (2016) Vitamin D supplementation for preventing infections in children under five years of age. Cochrane Database Syst Rev. 11(11):CD008824.	Intervention or exposure
Yang HM, Mao M, Wan C (2005) Vitamin A for treating measles in children. Cochrane Database Syst Rev. (4).	Study type (not a systematic review)
Yepes-Nuñez JJ, Brożek JL, Fiocchi A, Pawankar R, Cuello-García C, Zhang Y et al. (2018) Vitamin D supplementation in primary allergy prevention: Systematic review of randomized and non-randomized studies. Allergy. 73(1):37-49.	Population (age)
Yoon HK, Kyung WK, Min JK, In SS, et al. (2016) Vitamin D levels in allergic rhinitis: a systematic review and meta-analysis. Pediatr Allergy Immunol. 27(6):580-90.	Duplication of another review (Kim et al)

Reference	Reason for exclusion
Zalewski BM, Patro B, Veldhorst M, Kouwenhoven S, Crespo Escobar P, Calvo Lerma J, Koletzko B, van Goudoever J B, Szajewska H (2017) Nutrition of infants and young children (one to three years) and its effect on later health: A systematic review of current recommendations (EarlyNutrition project) Crit Rev Food Sci Nutr. 2017 Feb 11;57(3):489-500.	Intervention or exposure
Zhang LL, Gong J, Liu CT (2014) Vitamin D with asthma and COPD: not a false hope? A systematic review and meta-analysis. Genet Mol Res. 13(3):7607-16.	Intervention or exposure
Zheng M, Allman-Farinelli M, Heitmann BL, Rangan A (2015) Substitution of sugar-sweetened beverages with other beverage alternatives: a review of long-term health outcomes. J Acad Nutr Diet. 115(5):767-779.	Population
Zimmermann MB (2007) The adverse effects of mild-to-moderate iodine deficiency during pregnancy and childhood: a review. Thyroid. 17(9):829-35.	Study type (not a systematic review)
Zipitis, CS and Akobeng, AK. Vitamin D supplementation in early childhood and risk of type 1 diabetes: a systematic review and meta-analysis. Arch Dis Child. 93(6):512-7.	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Vitamin D and Health’ (March 2016)
2nd screening	
Charan, J, Goyal JP, Saxena D and Yadav P (2012) Vitamin D for prevention of respiratory tract infections: A systematic review and meta-analysis. J Pharmacol Pharmacother. 3(4):300-303.	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Vitamin D and Health’ (March 2016)

Reference	Reason for exclusion
Chung M, Balk EM, Brendel M, Ip, S, Lau, J, Lee, J et al (2009) Vitamin D and calcium: a systematic review of health outcomes. Evidence Report/technology Assessment. 183:1-420	Published before the publication cutoff date for consideration of evidence in the SACN report 'Vitamin D and Health' (March 2016)
Gera T, Sachdev HP and Nestel, P (2009) Effect of iron supplementation on physical performance in children and adolescents: systematic review of randomized controlled trials. Indian Pediatr. 44(1):15-24	Population (children aged 8 to 15 years)
Gera T, Sachdev HP and Nestel P (2009) Effect of combining multiple micronutrients with iron supplementation on Hb response in children: systematic review of randomized controlled trials. Public Health Nutr.12(6):756-73.	Published before the publication cutoff date for consideration of evidence in the SACN report 'Iron and Health' (March 2010)
Glasziou, PP and Mackerras, DEM (1993) Vitamin A supplementation in infectious diseases: A meta-analysis. BMJ. 6;306(6874):366-70.	Intervention (clinical)
Harris R, Nicoll, AD, Adair, PM and Pine, CM (2004) Risk factors for dental caries in young children: a systematic review of the literature. Community Dent Health. 21(1 Suppl):71-85	Published before the publication cutoff date for consideration of evidence in the SACN report 'Carbohydrates and Health' (January 2011)
Hossein Rouhani M, Haghighatdoost F, Surkan PJ and Azadbakht L (2016) Associations between dietary energy density and obesity: a systematic review and meta-analysis of observational studies. Nutrition.	Duplication of another SR
Kim YH, Kim KW, Kim MJ, Sol IS, Yoon SH, Ahn HS, Kim HJ, Sohn MH, Kim KE (2016) Vitamin D levels in allergic rhinitis: a systematic review and meta-analysis. Pediatr Allergy Immunol. 27(6):580-90.	Population (children aged below 16 years)

Reference	Reason for exclusion
Kosmeri C, Siomou E, Vlahos AP, Milionis H. Review shows that lipid disorders are associated with endothelial but not renal dysfunction in children. (2019) Acta Paediatr, 108(1), pp. 19-27.	Intervention (clinical)
Kuratko CN, Barrett EC, Nelson EB, Salem N Jr. The relationship of docosahexaenoic acid (DHA) with learning and behavior in healthy children: a review. Nutrients. 2013 Jul 19;5(7):2777-810	Population (children aged 4 to 14 years)
Manikam L, Sharmila A, Dharmaratnam A, Alexander EC, Kuah JY, Prasad A, Ahmed S, Lingam R, Lakhanpaul M. (2018) Systematic review of infant and young child complementary feeding practices in South Asian families: the Pakistan perspective. Public Health Nutr, 21(4), pp.655-668	Study type (abstract)
Mayo-Wilson E, Imdad A, Junior J, Dean S, Bhutta ZA. Preventive zinc supplementation for children, and the effect of additional iron: a systematic review and meta-analysis (2014) BMJ Open, 19;4(6), e004647	Duplicate of review included in this report
Sachdev H, Gera T, Nestel P. Effect of iron supplementation on mental and motor development in children: systematic review of randomised controlled trials (2005) Public Health Nutr, 8(2), pp:117-32.	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Iron and Health’ (March 2010)
Theodoratou E, Tzoulaki I, Zgaga L, Ioannidis JP. Vitamin D and multiple health outcomes: umbrella review of systematic reviews and meta-analyses of observational studies and randomised trials (2014) BMJ, 348, g2035.	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Vitamin D and Health’ (March 2016)
Tseng PT, Cheng YS, Chen YW, Stubbs B, Whiteley P, Carvalho AF, Li DJ, Chen TY, Yang WC, Tang CH, Chu CS, Yang WC, Liang HY, Wu CK, Yen CF, Lin PY. Peripheral iron levels in children with autism spectrum disorders vs controls: a systematic review and meta-analysis (2018) Nutr Res, 50, pp:44-52.	Population (clinical)

Reference	Reason for exclusion
Tubert-Jeannin S, Auclair C, Amsallem E, Tramini P, Gerbaud L, Ruffieux C, Schulte AG, Koch MJ, Rège-Walther M, Ismail A. Fluoride supplements (tablets, drops, lozenges or chewing gums) for preventing dental caries in children. (2011) Cochrane Database Syst Rev, 2011(12), CD007592.	Intervention (outside scope)
Wang B, Zhan S, Gong T, Lee L. Iron therapy for improving psychomotor development and cognitive function in children under the age of three with iron deficiency anaemia (2013) Cochrane Database Syst Rev, 2013(6), CD001444.	Population (clinical)
Winzenberg T, Powell S, Shaw KA, Jones G. Effects of vitamin D supplementation on bone density in healthy children: systematic review and meta-analysis (2011) BMJ, 342, c7254.	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Vitamin D and Health’ (March 2016)
Yakoob MY, Lo CW. Nutrition (Micronutrients) in Child Growth and Development: A Systematic Review on Current Evidence, Recommendations and Opportunities for Further Research (2017) J Dev Behav Pediatr, 38(8), pp.665-679.	Study type (not a systematic review)
Yoon, Hee Kim et al. (2016) Vitamin D levels in allergic rhinitis: a systematic review and meta-analysis. Pediatr Allergy Immunol. 27(6):580-90.	Duplicate of Kim et al (2016)
Zipitis CS, Akobeng AK. Vitamin D supplementation in early childhood and risk of type 1 diabetes: a systematic review and meta-analysis (2008) Arch Dis Child, 93(6), pp:512-7.	Published before the publication cutoff date for consideration of evidence in the SACN report ‘Vitamin D and Health’ (March 2016)

Table A4.2. List of references highlighted by interested parties through the call for evidence and reasons for exclusion

Reference	Reason for exclusion
Appleton J, Russell C G, Laws R, Fowler C, Campbell K, Denney-Wilson E. (2018) Infant formula feeding practices associated with rapid weight gain: A systematic review. Maternal & child nutrition 14(3):e12602	Population (age of participants) and intervention (infant feeding covered in 'Feeding in the first year of life').
Avery A, Anderson C, McCullough F (2017) Associations between children's diet quality and watching television during meal or snack consumption: A systematic review. Matern Child Nutr 13(4):e12428.	Study type (cross-sectional studies in children aged 12 to 60 months)
Bougma K, Aboud FE, Harding KB, Marquis GS (2013) Iodine and mental development of children 5 years old and under: a systematic review and meta-analysis. Nutrients 5(4):1384-416.	Population. Most of the studies in pregnant women or women of child bearing age
Businco L, Bruno,G, Giampietro,PG (1998) Soy protein for the prevention and treatment of children with cow-milk allergy. The American journal of clinical nutrition 68(6):1447S-1452S	Study design (not a systematic review), population (age of participants) and intervention (cow milk allergy).
Campbell KJ, Hesketh KD (2007) Strategies which aim to positively impact on weight, physical activity, diet and sedentary behaviours in children from zero to five years. A systematic review of the literature. Obes Rev 8(4):327-38.	All included studies covered in more recent or comprehensive reviews

Reference	Reason for exclusion
de Vet E, de Ridder D T D, de Wit J B F (2011) Environmental correlates of physical activity and dietary behaviours among young people: a systematic review of reviews. Obesity rev 12(5):e130-e142.	Picked up by literature search. Excluded on title and abstract for not meeting inclusion criteria on population (age of participants).
DiSantis K I, Hodges E A, Johnson S L, Fisher J O. (2011) The role of responsive feeding in overweight during infancy and toddlerhood: a systematic review. International journal of obesity 35(4):480.	Population (age of participants) and intervention (responsiveness and infant feeding covered in the SACN report 'Feeding in the first year of life').
Faith MS, Scanlon KS, Birch LL, Francis LA, Sherry B (2004) Parent-child feeding strategies and their relationships to child eating and weight status. Obes Res 12(11):1711-22.	Age (most studies outside the 1 to 5 age group)
Freitas A, Albuquerque G, Silva C, Oliveira A (2018) Appetite-Related Eating Behaviours: An Overview of Assessment Methods, Determinants and Effects on Children's Weight. Ann Nutr Metab 73:19–29	Study design (not a systematic review)
Gao J, Gao X, Li W, Zhu Y, Thompson P (2008) Observational studies on the effect of dietary antioxidants on asthma: a meta-analysis. Respirology 13(4):528-536	Population (age of participants)
Hanson KL, Connor LM (2014) Food insecurity and dietary quality in US adults and children: a systematic review. The American journal of clinical nutrition 100(2):684-692	Study design (all included studies in children aged 1 to 5 were cross-sectional)
Holley CE, Farrow C, Haycraft E (2017) A Systematic Review of Methods for Increasing Vegetable Consumption in Early Childhood. Curr Nutr Rep 6(2):157-170.	All included studies covered in more recent or comprehensive reviews

Reference	Reason for exclusion
Huncharek M, Muscat J, Kupelnick B (2008) Impact of dairy products and dietary calcium on bone-mineral content in children: results of a meta-analysis. Bone 43(2):312-321.	Age criteria (no studies in children 12 to 60 months)
Peters J, Sinn N, Campbell K, Lynch J (2012) Parental influences on the diets of 2-5-year-old children: Systematic review of interventions. Early Child Dev Care 182(7):837-857	All included studies covered in more recent or comprehensive reviews
Johnson L, Wilks DC, Lindroos AK, Jebb SA. (2009) Reflections from a systematic review of dietary energy density and weight gain: is the inclusion of drinks valid? Obesity Review 10(6):681-92	Population (age of participants) and intervention
Melina V, Craig,W, Levin,S (2016) Position of the Academy of Nutrition and Dietetics: Vegetarian Diets. Journal of the Academy of Nutrition and Dietetics 116(12):1970-1980.	Study design (not a systematic review)
Messina M, Rogero,MM, Fisberg,M, Waitzberg,D. (2017) Health impact of childhood and adolescent soy consumption. Nutrition reviews 75(7):500-515	Study design (not a systematic review)
Moorcroft K E, Marshall J L, Mc Cormick F M (2011) Association between timing of introducing solid foods and obesity in infancy and childhood: A systematic review. Maternal & child nutrition 7(1):3-26.	Picked up by literature search. Excluded on title and abstract on intervention (introduction of solid foods covered in the SACN report ‘Feeding in the first year of life’)
More J A, Emmett P M (2015). Evidenced-based, practical food portion sizes for preschool children and how they fit into a well balanced, nutritionally adequate diet. Journal of Human Nutrition and Dietetics 28(2):135-154	Picked up by literature search. Excluded on study design (not a systematic review)

Reference	Reason for exclusion
Nadelman P, Magno MB, Masterson D, da Cruz AG, Maia LC (2018) Are dairy products containing probiotics beneficial for oral health? A systematic review and meta-analysis. Clin Oral Investig 22(8):2763-2785.	Intervention or exposure (outside scope)
Newby P (2009) Plant foods and plant-based diets: protective against childhood obesity? The American journal of clinical nutrition 89(5):1572S-1587S	Study design (not a systematic review)
Sabate J, Wien, M. (2010) Vegetarian diets and childhood obesity prevention. Am J Clin Nutr 91(5):1525S-1529S.	Study design (not a systematic review)
Shloim N, Edelson L R, Martin N, Hetherington M M. (2015) Parenting Styles, Feeding Styles, Feeding Practices, and Weight Status in 4-12 Year-Old Children: A Systematic Review of the Literature. Frontiers in psychology 6:1849.	Population (age of participants)
Sova C, Feuling MB, Baumler M, Gleason L, Tam JS, Zafra H, Goday PS. (2013) Systematic review of nutrient intake and growth in children with multiple IgE-mediated food allergies. Nutrition in clinical practice 28(6):669-675.	Picked up by literature search. Excluded on title and abstract on population (children with multiple food allergies)
Srbely V, Janjua I, Buchholz AC, Newton G (2019) Interventions Aimed at Increasing Dairy and/or Calcium Consumption of Preschool-Aged Children: A Systematic Literature Review. Nutrients 11(4):714	Intervention (interventions to promote healthy eating were excluded)

Reference	Reason for exclusion
Szajewska H, Shamir R, Chmielewska A, Pieścik-Lech M, Auricchio R, Ivarsson A, Kolacek S, Koletzko S, Korponay-Szabo I, Mearin ML, Ribes-Koninckx C (2015) Systematic review with meta-analysis: early infant feeding and coeliac disease – update 2015. Alimentary pharmacology & therapeutics 41(11):1038-1054.	Intervention (introduction of allergenic foods covered in the SACN report 'Feeding in the first year of life') and population (age of participants)
Trumbo P R, River C R. (2014) Systematic review of the evidence for an association between sugar-sweetened beverage consumption and risk of obesity. Nutrition Reviews 72(9):566-574.	Population (age of participants)
Vandenplas Y, Castrellon,PG, Rivas,R et al (2014) Safety of soya-based infant formulas in children. British Journal of Nutrition 111(8):1340-1360	Population (age of participants) and intervention (COT Statement on the potential risks from high levels of soya phytoestrogens in the infant diet included in the SACN report 'Feeding in the first year of life')
Wilks DC, Mander AP, Jebb SA, Thompson SG, Sharp SJ, Turner RM, Lindroos AK. (2011) Dietary energy density and adiposity: employing bias adjustments in a meta-analysis of prospective studies. BMC Public Health 11(1):48	Picked up by literature search. Excluded on full text on population (age of participants)
Zarnowiecki D M, Dollman J, Parletta N. (2014) Associations between predictors of children's dietary intake and socioeconomic position: a systematic review of the literature. Obesity Reviews 15(5):375-391	Population (age of participants)

Table A4.3. List of references excluded at the data extraction stage

Reference	Reason for exclusion
Abdullah K, Kendzerska T, Shah P, Uleryk E, Parkin PC (2013) Efficacy of oral iron therapy in improving the developmental outcome of pre-school children with non-anaemic iron deficiency: a systematic review. Public Health Nutr. 16(8):497-506.	All included studies covered in more recent or comprehensive reviews
Alberdi G, McNamara AE, Lindsay KL, Scully HA, Horan MH, Gibney ER, McAuliffe FM (2016) The association between childcare and risk of childhood overweight and obesity in children aged 5 years and under: a systematic review. Eur J Pediatr. 175(10):1277-94	Intervention or exposure – childcare without a dietary component
Ambrosini GL (2014) Childhood dietary patterns and later obesity: a review of the evidence. Proc Nutr Soc 73(1):137-46.	Age (no studies in children aged 1 to 5 years)
Andrea SB, Hooker ER, Messer LC, Tandy T, Boone-Heinonen J (2017) Does the association between early life growth and later obesity differ by race/ethnicity or socioeconomic status? A systematic review. Ann Epidemiol 27(9):583-592.e5.	Age (exposure of PCS at 0 to 24 months)
Aryan Z, Rezaei N, Camargo CA Jr (2017) Vitamin D status, aeroallergen sensitization, and allergic rhinitis: A systematic review and meta-analysis. Int Rev Immunol 36(1):41-53.	Age (only 1 PCS in younger children but aged 4 to 8 years)

Reference	Reason for exclusion
Auerbach BJ, Wolf FM, Hikida A, Vallila-Buchman P, Littman A, Thompson D, Louden D, Taber DR, Krieger J (2017) Fruit Juice and Change in BMI: A Meta-analysis. Pediatrics 139(4): e20162454.	All included studies covered in more recent or comprehensive reviews
Autier P, Mullie P, Macacu A, Dragomir M, Boniol M, Coppens K, Pizot C, Boniol M (2017) Effect of vitamin D supplementation on non-skeletal disorders: a systematic review of meta-analyses and randomised trials. Lancet Diabetes Endocrinol 5(12):986-1004.	Age (no results in children aged 1 to 5 years)
Avery A, Anderson C, McCullough F (2017) Associations between children's diet quality and watching television during meal or snack consumption: A systematic review. Matern Child Nutr 13(4): e12428.	Study type (cross-sectional studies in children aged 1 to 5 years)
Bergmeier H, Skouteris H, Horwood S, Hooley M, Richardson B (2014) Associations between child temperament, maternal feeding practices and child body mass index during the preschool years: a systematic review of the literature. Obes Rev 15(1):9-18.	Exposure (child temperament outside scope)
Bougma K, Aboud FE, Harding KB, Marquis GS (2013) Iodine and mental development of children 5 years old and under: a systematic review and meta-analysis. Nutrients 5(4):1384-416.	Age (intervention or exposure in utero or in children aged <12 months)

Reference	Reason for exclusion
Brown RJ, de Banate MA, Rother KI (2010) Artificial sweeteners: a systematic review of metabolic effects in youth. Int J Pediatr Obes 5(4):305-12.	Outcome (self-regulation of energy intake not of direct public health interest)
Cai L, Wu Y, Cheskin LJ, Wilson RF, Wang Y (2014) Effect of childhood obesity prevention programmes on blood lipids: a systematic review and meta-analysis. Obes Rev 15(12): 933-44.	Age (no studies in children aged 1 to 5 years)
Cai L, Wu Y, Wilson RF, Segal JB, Kim MT, Wang Y (2014) Effect of childhood obesity prevention programs on blood pressure: a systematic review and meta-analysis. Circulation 129(18):1832-9.	Age (no studies in children aged 1 to 5 years)
Campbell KJ, Hesketh KD (2007) Strategies which aim to positively impact on weight, physical activity, diet and sedentary behaviours in children from zero to five years. A systematic review of the literature. Obes Rev 8(4):327-38.	All included studies covered in more recent or comprehensive reviews (included in the draft report)
Chen X, Wang Y (2008) Tracking of blood pressure from childhood to adulthood: a systematic review and meta-regression analysis. Circulation 117(25):3171-80.	Intervention or exposure (outside scope)
Chrestani MA, Santos IS, Horta BL, Dumith SC, de Oliveira Dode MA (2013) Associated factors for accelerated growth in childhood: a systematic review. Matern Child Health J 17(3):512-9.	Age (no studies in children aged 1 to 5 years)

Reference	Reason for exclusion
Cole NC, An R, Lee SY, Donovan SM (2017) Correlates of picky eating and food neophobia in young children: a systematic review and meta-analysis. Nutr Rev 75(7):516-532.	Study type (CS analyses reported from PCS in children aged 1 to 5 years)
Cui L, Li X, Tian Y, Bao J, Wang L, Xu D, Zhao B, Li W (2017) Breastfeeding and early childhood caries: a meta-analysis of observational studies. Asia Pac J Clin Nutr 26(5):867-880	All studies in children aged 1 to 5 years included in more comprehensive reviews (included in the report)
Dallacker M, Hertwig R, Mata J (2018) The frequency of family meals and nutritional health in children: a meta-analysis. Obes Rev. 19(5):638-653.	Age (cannot disaggregate results in children aged 1 to 5 years from results in other age groups. Review also picked up in literature search but was initially excluded)
De Costa P, Moller P, Bom Frost M and Olsen A (2017) Changing children's eating behaviour - A review of experimental research. Appetite, 113 (2017):327-357.	Study type (narrative review)
De Wild V, Jager G, Olsen A, Costarelli V, Boer E, Zeinstra G (2018) Breast-feeding duration and child eating characteristics in relation to later vegetable intake in 2–6-year-old children in ten studies throughout Europe. Public Health Nutrition 21(12):2320-2328.	Study type (narrative review)
de la Hunty A, Gibson S, Ashwell M (2013) Does regular breakfast cereal consumption help children and adolescents stay slimmer? A systematic review and meta-analysis. Obes Facts 6(1):70-85.	Study type (studies in children aged 1 to 5 years mainly cross-sectional)

Reference	Reason for exclusion
Dror, D K. (2014) Dairy consumption and pre-school, school-age and adolescent obesity in developed countries: a systematic review and meta-analysis. Obesity Reviews 15(6):516-527	All studies in children aged 1 to 5 years included in more comprehensive reviews (included in the report)
Elks CE, Heude B, de Zegher F, Barton SJ, Clément K, Inskip HM, Koudou Y, Cooper C, Dunger DB, Ibáñez L, Charles MA, Ong KK (2014) Associations between genetic obesity susceptibility and early postnatal fat and lean mass: an individual participant meta-analysis. JAMA Pediatr 168(12)1122-30.	Intervention or exposure (outside scope)
Eussen S, Alles M, Uijterschout L, Brus F, van der Horst-Graat J (2015) Iron intake and status of children aged 6-36 months in Europe: a systematic review. Ann Nutr Metab 66(2-3):80-92.	Research question (does not directly address the relationship between iron intake and status, or iron status and health outcomes)
Faith MS, Scanlon KS, Birch LL, Francis LA, Sherry B (2004) Parent-child feeding strategies and their relationships to child eating and weight status. Obes Res 12(11):1711-22.	Age (most studies outside the 1 to 5 age group)
Francis L, Shodeinde L, Black MM, Allen J (2018) Examining the Obesogenic Attributes of the Family Child Care Home Environment: A Literature Review. J Obes 3490651.	Research question
Friend A, Craig L, Turner S (2013) The prevalence of metabolic syndrome in children: a systematic review of the literature. Metab Syndr Relat Disord 11(2):71-80.	Age (no studies in children aged 1 to 5 years)

Reference	Reason for exclusion
Fulkerson JA, Larson N, Horning M, Neumark-Sztainer D (2014) A review of associations between family or shared meal frequency and dietary and weight status outcomes across the lifespan. J Nutr Educ Behav 46(1):2-19	Age (no studies in children aged 1 to 5 years)
Galobardes B, Lynch JW, Davey Smith G (2004) Childhood socioeconomic circumstances and cause-specific mortality in adulthood: systematic review and interpretation. Epidemiol Rev 26:7-21.	Intervention or exposure (outside scope)
Garcia-Marcos L, Castro-Rodriguez JA, Weinmayr G, Panagiotakos DB, Priftis KN, Nagel G (2013). Influence of Mediterranean diet on asthma in children: a systematic review and meta-analysis. Pediatr Allergy Immuno 24(4):330-8.	Age (no studies in children aged 1 to 5 years)
Gasser CE, Mensah FK, Russell M, Dunn SE, Wake M (2016) Confectionery consumption and overweight, obesity, and related outcomes in children and adolescents: a systematic review and meta-analysis. Am J Clin Nutr 103(5):1344-56.	Age (1 study in children aged 1 to 5 years but not possible to disaggregate results from this study)
Ghobadi S, Hassanzadeh-Rostami Z, Salehi-Marzijarani M, Bellissimo N, Brett NR, Totosy de Zepetnek JO, Faghih S (2018) Association of eating while television viewing and overweight/obesity among children and adolescents: a systematic review and meta-analysis of observational studies. Obes Rev 19(3):313-320.	Study type (studies in children aged 1 to 5 years all cross-sectional)

Reference	Reason for exclusion
Gibson, S. (2008) Sugar-sweetened soft drinks and obesity: a systematic review of the evidence from observational studies and interventions. Nutrition Research Reviews 21(2):134-147	All studies in children aged 1 to 5 years included in more recent, comprehensive reviews (included in the draft report)
Griebler U, Bruckmüller MU, Kien C, Dieminger B, Meidlinger B, Seper K, Hitthaller A, Emprechtinger R, Wolf A, Gartlehner G (2016) Health effects of cow's milk consumption in infants up to 3 years of age: a systematic review and meta-analysis. Public Health Nutr 19(2):293-307.	Age (no studies in children aged 1 to 5 years)
Gunanti, I R, Al-Mamun, A, Schubert, L and Long, K Z. (2016) The effect of zinc supplementation on body composition and hormone levels related to adiposity among children: a systematic review. Public Health Nutrition 19(16):2924-2939	All studies in children aged 1 to 5 years included in more comprehensive reviews (included in the draft report)
Gust JL, Logomarsino JV (2016) The Association Between Cartenoid Status and Body Composition in Children 2 - 18 Years of Age - A Systematic Review. Int J Vitam Nutr Res 86(3-4):91-120.	Study type (all studies in children age 1 to 5 were cross-sectional)
Hanson KL, Connor LM (2014) Food insecurity and dietary quality in US adults and children: a systematic review. Am J Clin Nutr 100(2):684-92.	Study type (all studies in children age 1 to 5 were cross-sectional)

Reference	Reason for exclusion
Hermoso M, Vucic V, Vollhardt C, Arsic A, Roman-Viñas B, Iglesia-Altaba I, Gurinovic M, Koletzko B (2011) The effect of iron on cognitive development and function in infants, children and adolescents: a systematic review. Ann Nutr Metab 59(2-4):154-65.	All included studies covered in more recent or comprehensive reviews
Hidayat K, Du X, Shi BM (2018) Body fatness at a young age and risks of eight types of cancer: systematic review and meta-analysis of observational studies. Obes Rev 19(10):1385-1394.	Age (meta-analyses in participants aged ≤30 years)
Hilger-Kolb J, Bosle C, Motoc I, Hoffmann K (2017) Associations between dietary factors and obesity-related biomarkers in healthy children and adolescents - a systematic review. Nutr J 16(1):85.	Age (no studies in children aged 1 to 5 years)
Holley CE, Farrow C, Haycraft E (2017) A Systematic Review of Methods for Increasing Vegetable Consumption in Early Childhood. Curr Nutr Rep 6(2):157-170.	All included studies covered in more recent or comprehensive reviews (included in the draft report)
Hooper L, Abdelhamid A, Moore H J, Douthwaite, W, Skeaff, C M, and Summerbell, C D. (2012) Effect of reducing total fat intake on body weight: systematic review and meta-analysis of randomised controlled trials and cohort studies. BMJ 345:e7666	Review updated by Naude et al (2018) (included in the report)
Hosseini B, Berthon BS, Wark P, Wood LG (2017) Effects of Fruit and Vegetable Consumption on Risk of Asthma, Wheezing and Immune Responses: A Systematic Review and Meta-Analysis. Nutrients 9(4):341.	Population (asthma at baseline for the 2 included studies with participants aged 1 to 5 years)

Reference	Reason for exclusion
Hujoel PP (2013) Vitamin D and dental caries in controlled clinical trials: systematic review and meta-analysis. Nutr Rev 71(2):88-97.	Age (results in children aged 1 to 5 years pooled in a meta-analysis with results in children outside this age group)
Huncharek M, Muscat J, Kupelnick B (2008) Impact of dairy products and dietary calcium on bone-mineral content in children: results of a meta-analysis. Bone 43(2):312-321.	Age (no studies in children aged 1 to 5 years)
Iaccarino Idelson P, Scalfi L, Valerio G (2017) Adherence to the Mediterranean Diet in children and adolescents: A systematic review. Nutr Metab Cardiovasc Dis 27(4):283-299.	Age (no studies in children aged 1 to 5 years)
Imdad, A and Bhutta, Z A. (2011) Effect of preventive zinc supplementation on linear growth in children under 5 years of age in developing countries: a meta-analysis of studies for input to the lives saved tool. BMC Public Health 11(supp 3): S22	All studies in children aged 1 to 5 years included in more recent, comprehensive reviews (included in the draft report)
Jensen M, Wood L, Williams R, Collins C (2013) Associations between sleep, dietary intake and physical activity in children: a systematic review. JBI Database of Systematic Reviews and Implementation Reports 11:227-262.	Study type (all cross-sectional studies)
Jiao J, Li Q, Chu J, Zeng W, Yang M, Zhu S (2014) Effect of n-3 PUFA supplementation on cognitive function throughout the life span from infancy to old age: a systematic review and meta-analysis of randomized controlled trials. Am J Clin Nutr 100(6):1422-36.	Age (no studies with participants aged 1 to 5 years)

Reference	Reason for exclusion
Johnson BJ, Zarnowiecki D, Hendrie GA, Mauch CE, Golley RK (2018) How to reduce parental provision of unhealthy foods to 3- to 8-year-old children in the home environment? A systematic review utilizing the Behaviour Change Wheel framework. Obes Rev 19(10):1359-1370.	Outside scope
Kairey L, Matvienko-Sikar K, Kelly C, McKinley MC, O'Connor EM, Kearney PM, Woodside JV, Harrington JM (2018) Plating up appropriate portion sizes for children: a systematic review of parental food and beverage portioning practices. Obes Rev 19(12):1667-1678.	Study type (all studies in children aged 1 to 5 years are cross-sectional studies)
Kaisari P, Yannakoulia M, Panagiotakos DB (2013) Eating frequency and overweight and obesity in children and adolescents: a meta-analysis. Pediatrics 131(5):958-67.	Study type (all cross-sectional studies)
Kantovitz KR, Pascon FM, Rontani RM, Gavião MB (2006) Obesity and dental caries--A systematic review. Oral Health Prev Dent 4(2):137-44.	Study type (all cross-sectional studies)
Keller A, Bucher Della Torre S (2015) Sugar-Sweetened Beverages and Obesity among Children and Adolescents: A Review of Systematic Literature Reviews. Child Obes 11(4): 338-46.	Not possible to disaggregate data in children aged 1 to 5 years
Khoshbakht Y, Bidaki R, Salehi-Abargouei A (2018) Vitamin D Status and Attention Deficit Hyperactivity Disorder: A Systematic Review and Meta-Analysis of Observational Studies. Adv Nutr 9(1):9-20.	Age (no studies in children aged 1 to 5 years)

Reference	Reason for exclusion
Lansigan R K, Emond J A, Gilbert-Diamond D (2015) Understanding eating in the absence of hunger among young children: A systematic review of existing studies. Appetite 85: 36-47	Age (no studies in children aged 1 to 5 years)
Larson N, Story M (2013) A review of snacking patterns among children and adolescents: what are the implications of snacking for weight status? Child Obes 9(2):104-15.	Intervention (at the level of the primary study in children aged 1 to 5 years)
Larson N, Ward DS, Neelon SB, Story M (2011) What role can child-care settings play in obesity prevention? A review of the evidence and call for research efforts. J Am Diet Assoc 111(9):1343-62.	Intervention (outside scope)
Lindsay AC, Mesa T, Greaney ML, Wallington SF, Wright JA (2017) Associations Between Maternal Depressive Symptoms and Nonresponsive Feeding Styles and Practices in Mothers of Young Children: A Systematic Review. JMIR Public Health Surveill 3(2):e29.	Intervention or exposure (outside scope)
Lloyd LJ, Langley-Evans SC, McMullen S (2012) Childhood obesity and risk of the adult metabolic syndrome: a systematic review. Int J Obes (Lond) 36(1):1-11.	Age (no studies in children aged 1 to 5 years)
Lohner S, Fekete K, Berti C, Hermoso M, Cetin I, Koletzko B, Decsi T (2012) Effect of folate supplementation on folate status and health outcomes in infants, children and adolescents: a systematic review. Int J Food Sci Nutr 63(8):1014-20.	Age (no studies in children aged 1 to 5 years)
Louie, J. C., Flood, V. M., Hector, D. J., Rangan, A. M. and Gill, T. P. (2011) Dairy consumption and overweight and obesity: a systematic review of prospective cohort studies. Obesity Reviews 12(7):e582-e592	All studies in children aged 1 to 5 years included in more recent, comprehensive reviews (included in the draft report)

Reference	Reason for exclusion
Lu, L., Xun, P., Wan, Y., He, K. and Cai, W. (2016) Long-term association between dairy consumption and risk of childhood obesity: a systematic review and meta-analysis of prospective cohort studies. European J Clin Nutr 70(4):414-423	All studies in children aged 1 to 5 years included in more recent, comprehensive reviews (included in the draft report)
Malik, V S, Schulze, M B, and Hu, F B. (2006) Intake of sugar-sweetened beverages and weight gain: a systematic review. Am J Clin Nutr 84(2):274-288	All studies in children aged 1 to 5 years included in more recent, comprehensive reviews (included in the draft report)
Marshall S, Burrows T, Collins CE (2014) Systematic review of diet quality indices and their associations with health-related outcomes in children and adolescents. J Hum Nutr Diet 27(6): 577-98.	Age (no studies in children aged 1 to 5 years)
Martin A, Bland RM, Connelly A, Reilly JJ (2016) Impact of adherence to WHO infant feeding recommendations on later risk of obesity and non-communicable diseases: systematic review. Matern Child Nutr 12(3):418-27.	Age (no studies in children aged 1 to 5 years)
Martineau AR, Jolliffe DA, Hooper RL, Greenberg L, Aloia JF, Bergman P, Dubnov-Raz G, Esposito S, Ganmaa D, Ginde AA, Goodall EC, Grant CC, Griffiths CJ, Janssens W, Laaksi I, Manaseki-Holland S, Mauger D, Murdoch DR, Neale R, Rees JR, Simpson S Jr, Stelmach I, Kumar GT, Urashima M, Camargo CA Jr (2017) Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data. BMJ 356:i6583.	Population (children aged 1 to 5 years were asthmatic at baseline)
Mayo-Wilson, E., Imdad, A., Herzer, K., Yakoob, M. Y. and Bhutta, Z. A. (2011) Vitamin A supplements for preventing mortality, illness, and blindness in children aged under 5: systematic review and meta-analysis. BMJ 343:d5094	Review updated by Imdad et al (2017) (included in the draft report)

Reference	Reason for exclusion
Mazarello Paes V, Ong KK, Lakshman R (2015) Factors influencing obesogenic dietary intake in young children (0-6 years): systematic review of qualitative evidence. BMJ Open 5(9):e007396.	Intervention or exposure (outside scope)
McDonagh M, Blazina I, Dana T, Cantor A, Bougatsos C (2015) Routine Iron Supplementation and Screening for Iron Deficiency Anemia in Children Ages 6 to 24 Months: A Systematic Review to Update the U.S. Preventive Services Task Force Recommendation [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US); Report No.: 13-05187-EF-1.	All included studies covered in more recent or comprehensive reviews (included in the draft report)
McPhie S, Skouteris H, Daniels L, Jansen E (2014) Maternal correlates of maternal child feeding practices: a systematic review. Matern Child Nutr 10(1): 18-43.	Intervention or exposure (outside scope)
Monasta L, Batty GD, Cattaneo A, Lutje V, Ronfani L, Van Lenthe FJ, Brug J (2010) Early-life determinants of overweight and obesity: a review of systematic reviews. Obes Rev 11(10):695-708.	Did not include relevant SR (on exposure and age) not already included in this report
Muckelbauer R, Barbosa CL, Mittag T, Burkhardt K, Mikelaishvili N, Müller-Nordhorn J (2014) Association between water consumption and body weight outcomes in children and adolescents: a systematic review. Obesity 22(12): 2462-75.	Age (no studies in children aged 1 to 5 years)
Nadelman P, Magno MB, Masterson D, da Cruz AG, Maia LC (2018) Are dairy products containing probiotics beneficial for oral health? A systematic review and meta-analysis. Clin Oral Investig 22(8):2763-2785.	Intervention or exposure (outside scope)

Reference	Reason for exclusion
Papamichael MM, Itsiopoulos C, Susanto NH, Erbas B (2017) Does adherence to the Mediterranean dietary pattern reduce asthma symptoms in children? A systematic review of observational studies. Public Health Nutr 20(15):2722-2734.	Population (children aged 1 to 5, asthmatic at baseline)
Papamichael MM, Shrestha SK, Itsiopoulos C, Erbas B (2018) The role of fish intake on asthma in children: A meta-analysis of observational studies. Pediatr Allergy Immunol 29(4):350-360.	Age (no studies in children aged 1 to 5 years)
Patel AI, Moghadam SD, Freedman M, Hazari A, Fang ML, Allen IE. The association of flavored milk consumption with milk and energy intake, and obesity: A systematic review. Prev Med 111:151-162.	Outcome (self-regulation of energy intake not of direct public health interest)
Patro-Gołąb B, Zalewski BM, Kołodziej M, Kouwenhoven S, Poston L, Godfrey KM, Koletzko B, van Goudoever JB, Szajewska H (2016) Nutritional interventions or exposures in infants and children aged up to 3 years and their effects on subsequent risk of overweight, obesity and body fat: a systematic review of systematic reviews. Obes Rev 17(12):1245-1257.	Systematic review (SR) of SRs. All included SRs on exposures of interest to this risk assessment were identified for inclusion through the literature search for this risk assessment
Pawlak R, Bell K (2017) Iron Status of Vegetarian Children: A Review of Literature. Ann Nutr Metab 70(2):88-99.	Study type (studies in children aged 1 to 5 years mainly cross-sectional)
Pereira-da-Silva L, Rêgo C, Pietrobelli A (2016) The Diet of Preschool Children in the Mediterranean Countries of the European Union: A Systematic Review. Int J Environ Res Public Health 13(6):572.	Study type (studiesor analyses in children aged 1 to 5 years are cross-sectional)
Peters J, Sinn N, Campbell K, Lynch J (2012) Parental influences on the diets of 2-5-year-old children: Systematic review of interventions. Early Child Dev Care 182(7):837-857	All included studies covered in more recent or comprehensive reviews

Reference	Reason for exclusion
Peters JD, Parletta N, Campbell KJ, Lynch JW (2014) Parental influences on the diets of 2- to 5-year-old children: Systematic review of qualitative research. J Early Child Res 12:19 - 3.	Study type (qualitative research)
Petry N, Olofin I, Boy E, Donahue A & Rohner F (2016) The Effect of Low Dose Iron and Zinc Intake on Child Micronutrient Status and Development during the First 1000 Days of Life: A Systematic Review and Meta-Analysis. Nutrients 30;8(12):773.	Age (<50% weighting of MAs from studies that included children aged 1 to 5 years)
Ramakrishnan U, Aburto N, McCabe G, Martorell R (2004) Multimicronutrient interventions but not vitamin A or iron interventions alone improve child growth: results of 3 meta-analyses. J Nutr 134(10):2592-602.	All included studies covered in more recent or comprehensive reviews
Reid AE, Chauhan BF, Rabbani R, Lys J, Copstein L, Mann A et al. (2016) Early Exposure to Nonnutritive Sweeteners and Long-term Metabolic Health: A Systematic Review. Pediatrics 137(3):e20153603	All studies in children aged 1 to 5 years included in more recent, comprehensive reviews (included in the report)
Roberts JL, Stein AD (2017) The Impact of Nutritional Interventions beyond the First 2 Years of Life on Linear Growth: A Systematic Review and Meta-Analysis. Adv Nutr 8(2): 323-336.	All included studies covered in more recent or comprehensive reviews; no subgroup analyses in age group of interest
Rocha NP, Milagres LC, Longo GZ, Ribeiro AQ, Novaes JF (2017) Association between dietary pattern and cardiometabolic risk in children and adolescents: a systematic review. J Pediatr (Rio J) 93(3):214-222.	Study type (studies in children aged 1 to 5 years mainly cross-sectional)
Rocha NP, Milagres LC, Novaes JF, Franceschini Sdo C (2016) Association between food and nutrition insecurity with cardiometabolic risk factors in childhood and adolescence: a systematic review. Rev Paul Pediatr 34(2):225-33.	Study type (studies in children aged 1 to 5 years mainly cross-sectional)

Reference	Reason for exclusion
Rogers PJ, Hogenkamp PS, de Graaf C, Higgs S, Lluch A, Ness AR, Penfold C, Perry R, Putz P, Yeomans MR, Mela DJ (2016) Does low-energy sweetener consumption affect energy intake and body weight? A systematic review, including meta-analyses, of the evidence from human and animal studies. Int J Obes 40(3):381-94.	Outcome - studies in children aged 1 to 5 years did not examine outcomes of interest to this report
Rylatt L, Cartwright T (2016) Parental feeding behaviour and motivations regarding pre-school age children: A thematic synthesis of qualitative studies. Appetite 99:285-297.	Study type (narrative review)
Schürmann S, Kersting M, Alexy U (2017) Vegetarian diets in children: a systematic review. Eur J Nutr 56(5):1797-1817.	Study type (studies in children aged 1 to 5 years were descriptive)
Silventoinen K, Rokholm B, Kaprio J, Sørensen TI (2010). The genetic and environmental influences on childhood obesity: a systematic review of twin and adoption studies. Int J Obes 34(1):29-40.	Intervention or exposure – (genetic and environmental factors, not specific to diet)
Simmonds M, Llewellyn A, Owen CG, Woolacott N (2016) Predicting adult obesity from childhood obesity: a systematic review and meta-analysis. Obes Rev 17(2):95-107.	Age (no studies in children aged 1 to 5 years)
Sioen I, Lust E, De Henauw S, Moreno LA, Jiménez-Pavón D (2016) Associations Between Body Composition and Bone Health in Children and Adolescents: A Systematic Review. Calcif Tissue Int 99(6):557-577.	Age (no studies in children aged 1 to 5 years)
Skouteris H, McCabe M, Swinburn B, Newgreen V, Sacher P, Chadwick P (2011) Parental influence and obesity prevention in pre-schoolers: a systematic review of interventions. Obes Rev 12(5):315-28.	All included studies covered in more recent or comprehensive reviews

Reference	Reason for exclusion
Sleddens EF, Gerards SM, Thijs C, de Vries NK, Kremers SP (2011) General parenting, childhood overweight and obesity-inducing behaviors: a review. Int J Pediatr Obes 6(2-2):e12-27.	Age (no studies with a dietary component in children aged 1 to 5 years)
Smithers LG, Golley RK, Brazionis L, Lynch JW (2011) Characterizing whole diets of young children from developed countries and the association between diet and health: a systematic review. Nutr Rev 69(8):449-67.	Study type (cross-sectional studies)
Stammers AL, Lowe NM, Medina MW, Patel S, Dykes F, Pérez-Rodrigo C, Serra-Majam L, Nissensohn M, Moran VH (2015) The relationship between zinc intake and growth in children aged 1-8 years: a systematic review and meta-analysis. Eur J Clin Nutr 69(2):147-53.	All studies in children aged 1 to 5 years included in a more comprehensive review (included in the report)
Szajewska H, Ruszczynski M, Chmielewska A (2010) Effects of iron supplementation in nonanemic pregnant women, infants, and young children on the mental performance and psychomotor development of children: a systematic review of randomized controlled trials. Am J Clin Nutr 91(6):1684-90.	All included studies covered in more recent or comprehensive reviews
Tan SF, Tong HJ, Lin XY, Mok B, Hong CH (2016) The cariogenicity of commercial infant formulas: a systematic review. Eur Arch Paediatr Dent 17(3):145-56.	Age (only 2 small studies in children aged 1 to 5 years)
te Velde S J , van Nassau F, Uijtdewilligen L, van Stralen M M, Cardon G, De Craemer M, Manios Y, Brug J and Chinapaw M J M (2012) Energy balance-related behaviours associated with overweight and obesity in preschool children: a systematic review of prospective studies. Obes Rev 13(supp 1): 56-74	All studies in children aged 1 to 5 years included in more recent reviews (included in the report)

Reference	Reason for exclusion
Thomopoulos TP, Ntouvelis E, Diamantaras AA, Tzanoudaki M, Baka M, Hatzipantelis E, Kourti M, Polychronopoulou S, Sidi V, Stiakaki E, Moschovi M, Kantzanou M, Petridou ET (2015) Maternal and childhood consumption of coffee, tea and cola beverages in association with childhood leukemia: a meta-analysis. Cancer Epidemiol 39(6):1047-59.	Age and study type (studies in children aged 1 to 5 years mainly cross-sectional)
Verduci E, Martelli A, Miniello VL, Landi M, Mariani B, Brambilla M, Diaferio L, Peroni DG (2017) Nutrition in the first 1000 days and respiratory health: A descriptive review of the last five years' literature. Allergol Immunopathol (Madr) 45(4):405-413.	Study type (narrative review)
Vollmer RL, Mobley AR (2013) Parenting styles, feeding styles, and their influence on child obesogenic behaviors and body weight. A review. Appetite 71:232-41	Age (no PCS in children aged 1 to 5 years)
Vucic V, Berti C, Vollhardt C, Fekete K, Cetin I, Koletzko B, Gurinovic M, van't Veer P (2013) Effect of iron intervention on growth during gestation, infancy, childhood, and adolescence: a systematic review with meta-analysis. Nutr Rev 71(6):386-401.	All included studies covered in more recent or comprehensive reviews
Young KG, Duncanson K, Burrows T (2018) Influence of grandparents on the dietary intake of their 2-12-year-old grandchildren: A systematic review. Nutr Diet 75(3):291-306.	Exposure (no feedingor dietary component in the study in children aged 1 to 5 years)
Wallace TC (2018) A Comprehensive Review of Eggs, Choline, and Lutein on Cognition Across the Life-span. J Am Coll Nutr 37(4):269-285.	Age (no studies in children aged 1 to 5 years when exposure was measured)

Reference	Reason for exclusion
Ward DS, Welker E, Choate A, Henderson KE, Lott M, Tovar A, Wilson A, Sallis JF (2017) Strength of obesity prevention interventions in early care and education settings: A systematic review. Prev Med 95 Suppl:S37-S52.	Outside scope of risk assessment
Warthon-Medina M, Moran VH, Stammers AL, Dillon S, Qualter P, Nissensohn M, Serra-Majem L, Lowe NM (2015) Zinc intake, status and indices of cognitive function in adults and children: a systematic review and meta-analysis. Eur J Clin Nutr 69(6): 649-61.	Study type (no trials and no cohorts conducted in children aged 1 to 5 years)
Winzenberg TM, Shaw K, Fryer J, Jones G (2006) Calcium supplementation for improving bone mineral density in children. Cochrane Database Syst Rev (2):CD005119.	Age (Only 1 study in age group of interest)
Woo Baidal JA, Locks LM, Cheng ER, Blake-Lamb TL, Perkins ME, Taveras EM (2016) Risk Factors for Childhood Obesity in the First 1,000 Days: A Systematic Review. Am J Prev Med, 50(6):761-779.	Age (studies in children aged 0 to 2 years)
Zhang Z, Pereira JR, Sousa-Sá E, Okely AD, Feng X, Santos R (2018) Environmental characteristics of early childhood education and care centres and young children's weight status: A systematic review. Prev Med 106:13-25	Population (studies in children aged 1 to 5 years from LMIC)

Annex 5: Evidence tables

Energy and Macronutrients

Table A5.1. Evidence table – energy and macronutrients

Study	Methods	Included studies	Results	Comments
Frantsve-Hawley et al (2017) 'A systematic review of the association between consumption of sugar-containing beverages and excess weight gain among children under age 12' Study design Systematic review Funding Robert Wood Johnson Foundation Declaration of interest Not specified	Research question To evaluate the available evidence examining the longitudinal association between adiposity and the consumption of sugar-containing beverages (SCB) (including SSBs and 100% fruit juice), and between adiposity and the consumption of only 100% fruit juices among children under age 12. Search criteria *Search dates*: to 29 March 2016 *Study design*: PCS, RCT and CCT *Language*: English *Population*: children aged <12 years at baseline; children with chronic health conditions (for example, diabetes, asthma) were excluded *Intervention or exposure and comparators*: - caloric SCBs (which include all sugar-sweetened non-dairy beverages and 100% fruit juice) - 100% fruit juice only Primary outcomes	Number of studies 38 studies (1 RCT, 3 CCT and 34 PCS), of which 13 PCS had participants aged 12 to 60 months at baseline. 4 of 13 used data from 2 cohorts. Number of participants Of the 13 PCS, 8 included more than 1000 participants. Countries HIC	Results for the age group covered in this report Association between SCB and BMI, overweight or obesity (9 PCS) To note that 3 PCS (Dubois, 2007, Lim, 2009 and Welsh, 2005) were included in the MA by Te Morenga et al (2012) - 6 PCS reported a direct association and 3 PCS reported no association (see Annex 8, Table A8.2 for details) Association between SSB and central adiposity - No studies identified within the age range of interest in this report. Association between fruit juice and total adiposity (7 PCS) (this evidence is reported in the 'Foods and dietary patterns' chapter) - 4 PCS reported a direct association, and 3 PCS reported no association (see Annex 8, Table A8.24 for details) Association between FJ and central adiposity - No studies identified within the age range of interest in this report	Risk of bias/quality - Critical Appraisal Skills Programme (CASP) used for cohort study risk of bias assessment. Confounding factors - The review authors reported whether and what confounding factors were adjusted for by each study; the review authors noted that results may be an underestimation of a true effect due to confounding not adequately addressed in the analysis. Limitations (from the authors) - Review relied on a count of studies with statistically significant direct versus inverse results. - Not able to assess publication bias because of qualitative nature. - Not able to evaluate clinically relevant effect sizes since a meta-analysis was not possible. - Review included only the results of the main analysis

Study	Methods	Included studies	Results	Comments
	- Change in total adiposity (measures: BMI z-scores (BMIz), BMI, % body fat, weight change, incidence of obesity, incidence of overweight, prevalence of obesity, prevalence of overweight) - Change in central adiposity (measures: waist circumference, weight to hip ratio) Statistical analyses - Meta-analyses and subgroup analyses were planned but not undertaken due to methodological heterogeneity. - Used "vote counting", a means of using the presence or absence of statistically significant results, to summarise the available evidence.			from each study. Results of analyses that were further stratified by baseline weight were not included, and it is possible that SCB consumption may have greater impact on those with different weight and obesity status at baseline. Limitations (from the review team) - The authors reported as a limitation that "almost all included studies were retrospective". It is unclear what they refer to as most of the included studies are prospective studies that assessed beverage consumption at baseline and in some cases at follow-up. AMSTAR overall confidence rating: moderate

Hörnell et al (2013) 'Protein intake from 0-18 years of age and its relation to health: a systematic literature review for the 5th Nordic Nutrition Recommendations' Study design Systematic review Funding Nordic Council of Ministers Declaration of interest None to declare	Research question What are the effects of different intakes and different sources of protein (animal- or plant-based) in infancy and childhood, while considering other energy-giving nutrients on: 1) functional or clinical outcomes, including growth and development? 2) well-established markers or indicators of functional or clinical outcomes, such as serum lipids, glucose and insulin, blood pressure, body weight, body composition and bone mineral density, in childhood, adolescence and adulthood? Search criteria *Search dates:* January 2000 to February 2012 *Search design*: human studies *Language:* English or Nordic language *Population:* healthy children from a study population relevant to the Nordic countries *Intervention or exposure:* different intakes and different sources of protein (animal or plant-based) Primary outcomes - Growth and body composition, for example, BMI, % body fat (%BF), adiposity rebound (AR) and sIGF-I	Number of studies 38 studies (9 trials, 21 PCS, 8 CS), of which 13 studies (reporting on 9 PCS) included participants aged 12 to 60 months at baseline. Number of participants Of the 13 studies of interest, 3 included fewer than 100 participants, 7 had 100 to 300 participants, 3 had 450 to 950 participants, and 1 had nearly 3300 participants. Age of participants Most of the 13 studies of interest included children aged 6 to 24 months at baseline, with most follow-up until age 5 to 8 years (1 up to 18 years old). Countries HIC, including UK Exposure The majority of the 13 studies of interest reported protein intakes or energy-adjusted protein intakes (g per	Results of interest for the age group covered in this report Protein intake and BMI and body composition (%BF) (5 publications reporting on 4 PCS) - all 5 PCS (2 in the same cohort) reported a direct association (see Annex 8, Table A8.8 for details) Protein intake and adiposity rebound (AR) (3 PCS) - all 3 PCS reported no association between protein intake and timing of AR (see Annex 8, Table A8.9 for details) Animal protein intake and growth (1 PCS) - the PCS reported that a direct association (see Annex 8, Table A8.9 for details) Total and animal protein intake and puberty (4 studies, 2 from same cohort, DONALD) – all 4 PCS reported an association between total or animal protein intake and earlier onset of puberty (see Annex 8, Table A8.10 for details) Vegetable protein intake and puberty (2 PCS) – both PCS reported an inverse association (see Annex 8, Table A8.10 for details)	Risk of bias or quality - Study quality assessed using QAT, which includes questions about study design, population characteristics, exposure and outcome measures, dietary assessment, and confounders. - Studies were rated A (low RoB), B, or C (high RoB). Studies graded C were not used in the final grading of the evidence and were not reported in evidence tables. - Evidence graded 'convincing' (grade 1), 'probable' (grade 2), 'limited-suggestive' (grade 3), and 'limited-inconclusive' (grade 4) depending on the number and quality of supporting, non-supporting, and contradicting studies. Confounding factors - The SR reported whether included studies adjusted for confounding factors and which ones. Limitations (from the authors) - When papers originated from the same research group, it was not always possible to tell whether the participating children were the same in several studies. This is problematic as evidence grading requires evidence from at least two independent cohort studies (the authors took this into account in their grading).

Study	Methods	Included studies	Results	Comments
	- Bone health (bone mineral content, BMC or bone mineral density, BMD) - Puberty timing - Glucose-insulin metabolism - Blood pressure - Neurodevelopment	day or % energy or g or kg of reference body weight per day). 1 study reported total red and white meat intake. A couple of studies also reported intakes of different types of protein (animal vs vegetable).	Protein intake and bone health (1 PCS) - 1 PCS reported a direct association between protein intake and BMD and BMC (see Annex 8, Table A8.11 for details) Protein intake and neurodevelopment (2 PCS) - Both PCS reported a direct association between protein intake and neurodevelopment (see Annex 8, Table A8.11 for details) sIGF-I; glucose-insulin metabolism; blood pressure - No trials or PCS in children aged 1 to 5 years identified for these outcomes.	- Many of the included studies do not differentiate between the effects of protein and other properties of the protein source (for example, dairy products) AMSTAR overall confidence rating: moderate

Luger et al (2017) Sugar-Sweetened Beverages and Weight Gain in Children and Adults: A Systematic Review from 2013 to 2015 and a Comparison with Previous Studies Study design Systematic review Funding European Association for the Study of Obesity Healthy Hydration Working Group Declaration of interest None to declare	Research question Association between sugar-containing drinks and body weight and obesity Search criteria Search dates: up to July 2008 Study design: RCT and cohort Population: children and adults Intervention or exposure and comparators: sugar-containing drink consumption Primary outcomes - Body weight - BMI - Adiposity	Number of studies 30 studies, of which 10 were in adults (9 PCS and 1 RCTs) and 20 were in children (17 PCS and 3 RCTs). Of the 20 studies in children, 6 included participants aged 12 to 60 months at baseline. Of these, 2 PCS were uniquely identified and included in this SR (see Annex 6, Table A6.1 for mapping of primary studies) and have been extracted into Annex 8, Table A8.2. Number of participants For the 2 PCS of interest, 1 PCS included 67 participants and the other included 227 participants Age of participants For the 2 PCS of interest, participants were aged 1 to 2 years at baseline and follow up was 6 months and 13 years Countries HIC and UMIC	Results of interest for the age group covered in this report Both PCS reported a direct association between SSB consumption and risk of obesity or body weight (see Annex 8, Table A8.2 for details)	Risk of bias or quality For PCS, the Newcastle Ottawa Scale was used for risk of bias assessment The two unique studies of interest scored a ‘good’ and a ‘medium’ quality score Confounding factors The majority of the PCS adjusted for possible confounders including several nutrition and lifestyle factors, and for all, except for one study, Limitations (from the authors) - Total energy adjustments might influence the direction of the relationship between SSB intake and body weight measures and might change research results - As SSBs add calories to the diet, adjustment for total energy intake might lead to an underestimation of the effect of SSBs on body weight as total energy intake mediates the association between SSBs and body weight AMSTAR overall confidence rating: low

Naude et al (2018) ‘Effects of total fat intake on bodyweight in children’ <u>Study design</u> Updated systematic review (in children only) <u>Funding</u> World Health Organisation <u>Declaration of interest</u> Authors part supported by the Effective Healthcare Research Consortium, UK, which is funded by UK aid from the UK government for the benefit of developing countries.	<u>Research question</u> To assess the effects of total fat intake on measures of weight and body fatness in children and young people not aiming to lose weight. <u>Search criteria</u> *Search dates:* to May 2017 *Search design:* RCTs and cohort studies *Language:* no restriction *Population*: children and young people (aged 24 months to 18 years) with or without risk factors for cardiovascular disease; children who were acutely ill as well as disease- or condition-specific populations, such as children with cystic fibrosis, autism or diabetes, were excluded. Intervention studies where the selection of participants was primarily for raised weight or BMI with the intention to reduce weight were excluded. *Intervention or exposure and comparator:* - RCTs: lower fat intake compared with usual diet or modified fat intake with no intention to reduce weight (in any groups), continued for at least 6 months unconfounded by non-nutritional interventions - cohort studies: total dietary fat intake (in grams, as % total dietary energy intake or as one of the defining characteristics of a dietary pattern) assessed at baseline and related to a measure of body fatness, or change in body fatness, at least one year later.	<u>Number of studies</u> 24 studies (3 RCTs and 21 PCS), of which 6 PCS included participants aged 12 to 60 months at baseline. <u>Number of participants</u> Of the 6 PCS of interest, sample sizes ranged from 53 to 740, with most studies including 100 to 250 participants. <u>Age of participants</u> Of the 6 PCS of interest, participants were aged between 2 and 4.5 years old at baseline, with follow-up durations of 1 to 17 years. <u>Countries</u> HIC	<u>Results of interest for the age group covered in this report</u> <u>Primary outcomes</u> Total dietary fat and body weight (2 PCS) - both PCS reported no association between dietary fat intake and body weight. Total dietary fat and BMI (5 PCS) - 2 of 3 PCS reported a direct association after 2 to 3 years of follow-up. 1 of 3 PCS reported no association. 2 of 2 PCS reported a direct association after 6 to 14 years follow-up. Association between total dietary fat exposure and body fat or fat mass index (1 PCS) - the PCS reported a direct association For details see Annex 8, Table A8.4. <u>Secondary outcomes</u> Association between total dietary fat exposure and height (2 PCS) - neither study reported any association between total dietary fat and height after 1 to 2 years follow up. (See Annex 8, Table A8.7 for details) No studies in children aged 12 to 60 months were identified that assessed the relationship between total fat intake and cardiometabolic risk factors.	<u>Risk of bias or quality</u> - RCTs assessed using the Cochrane tool; ‘other bias’ consisted of whether trials were free of differences in diet between intervention and control groups other than dietary fat intake. - PCS assessed using Cochrane methodology, including matching of more-exposed and less-exposed groups, whether groups differed in components other than total fat, ascertainment of exposures and outcomes, assessment of prognostic factors. - GRADE system used to rank the quality of evidence. <u>Confounding factors</u> Of the 6 PCS of interest, 4 studies did not or did not fully adjust for important prognostic variables (age, sex, energy intake, ethnicity, physical activity, parental BMI, pubertal stage and socioeconomic status) <u>Limitations</u> (from the authors) - GRADE assessments for cohort studies on primary outcomes very low therefore confidence in the validity of the findings was limited. - Evidence on the link between dietary fat intake and body fatness in non-obese children

Study	Methods	Included studies	Results	Comments
	Primary outcomes - Measure of body fatness at least 6 months after the intervention was initiated (RCTs) - Absolute or change in body fatness at least one year later (PCS) Secondary outcomes - Cardiometabolic risk factors (LDL, HDL cholesterol, TAG, systolic and diastolic blood pressure) - Height Statistical analysis - Meta-analysis, subgroup analysis (to investigate heterogeneity) and sensitivity analysis were planned but not all were undertaken due to the diversity of methodologies, analysis methods, dietary assessments, ages at baseline, applications of total fat intake exposure and eligible outcome measures. None of these analyses were undertaken using studies with children aged 12 to 60 months.			across systematic reviews was sparse. AMSTAR overall confidence rating: high

Study	Methods	Included studies	Results	Comments
Parsons et al (1999) ‘Childhood predictors of adult obesity: a systematic review’ Study design Systematic review Funding Department of Health or Medical Research Council Nutrition Research Initiative Declaration of interest None declared	Research question To identify factors in childhood which might influence the development of obesity in adulthood. Search criteria *Search dates:* up to Spring 1998 *Study design:* longitudinal observational studies; studies that were <1 year in duration were excluded *Language:* not stated *Population:* healthy children (<18 years old) from industrialised countries; studies on minority or special groups (for example, vegans, children born preterm or to diabetic mothers) were excluded. *Intervention or exposure and comparators:* measurements of predictors of obesity (including diet and physical activity [PA]) Primary outcome Any measure of fatness, leanness or relative weight, or change in fatness, leanness or relative weight (measured at least 1 year after exposure assessment); measures of fat distribution were not included.	Number of studies 8 PCS (reported in 12 publications) on child dietary intake, of which 4 PCS (reported in 5 publications) included measurements at ages 12 to 60 months. To note, 2 PCS were reported in the SR by Naude et al (2018) on total dietary fat intake and bodyweight in children. Number of participants The 4 PCS included between 37 and 450 participants. Age of participants Of the studies of interest, children were aged >6 months at baseline and followed-up until age 6 to 15 years. Countries HIC	Results of interest for the age group covered in this report Child dietary intake and fatness in later childhood (4 PCS reported in 5 publications) Energy intake (3 PCS, reported in 4 publications) Of the 3 PCS, 1 reported a direct association between energy intake and body fatness, and 2 reported an inverse association (in one of these studies, the association was found in girls only). (See Annex 8, Table A8.1 for details) Total carbohydrates (2 PCS) - Both PCS reported no association between total carbohydrate intake and BMI or skinfolds. (See Annex 8, Table 8.2 for details) Dietary fat (1 PCS) – the PCS reported no association between dietary fat intake and BMI or skinfolds. (See Annex 8, Table A8.4 for details) Protein (1 PCS) - 1 PCS reported a direct association between protein intake and BMI or skinfolds (See Annex 8, Table A8.8 for details)	Risk of bias or quality Study quality not formally assessed due to difficulties in developing quality criteria for a heterogeneous group of studies. However, limitations of studies identified were discussed in each section of the review. Confounding Possible confounders including parental fatness, socioeconomic status, energy expenditure and physical activity not accounted for in most studies of interest. Limitations (from the review authors) - All studies of interest were small and conducted between 1984 and 1998 - Majority of studies estimated dietary intake using a dietary history method which is considered a crude method of measuring intakes - The authors note that it remains unresolved whether any relationships between dietary factors (and physical activity) and later fatness are due to a direct effect, or to tracking in dietary and activity behaviour. AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Perez-Morales et al (2013) ‘Sugar-sweetened beverage intake before 6 years of age and weight or BMI status among older children; systematic review of prospective studies’ Study design Systematic review Funding Not specified Declaration of interest Not specified	Research question To conduct a systematic review of prospective studies that examined the association between SSB intake before six years of age and later weight or BMI status among older children. Search criteria *Search dates:* 2001 to 2011 *Study design:* prospective cohort studies *Language:* English and Spanish *Population*: children < 6 years old *Exposure and comparators:* intake of SSB, including soft drinks, soda, fruit drinks, sports drinks, sweetened iced tea, and lemonade Primary outcome - Weight - BMI - Waist circumference	Number of studies 7 PCS, of which 1 PCS was uniquely identified by and included in this SR (see Annex 6, Table A6.1 for mapping of primary studies) Number of participants The PCS included 135 participants Age of participants Participants were aged 3 to 5 years at baseline and followed up for 3 years Countries HIC	Results from the PCS uniquely identified by this SR The PCS reported that SSB consumption was directly associated with child waist circumference (see Annex 8, Table A8.2 for details).	Risk of bias or quality - No formal tool was used to assess RoB; the review authors only commented that 2 of the studies had less RoB than the others. Confounding factors - The review authors did not comment on confounding factors. AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Rouhani et al (2016) 'Associations between dietary energy density and obesity: A systematic review and meta-analysis of observational studies' <u>Study design</u> Systematic review with meta-analysis of observational studies <u>Funding</u> The Research Council of the Food Security Research Center, Isfahan University of Medical Sciences <u>Declaration of interest</u> Not specified	<u>Research question</u> To examine whether evidence from observational studies overall show a direct link between dietary energy density (DED) and obesity, and to calculate an estimate of the risk. <u>Search criteria</u> *Search dates:* up to January 2015 *Study design:* observational studies *Language:* no restrictions *Population:* children (>2 years old) and adults (≤60 years old) *Exposure and comparators:* DED; studies that did not consider DED for the whole diet were excluded <u>Primary outcomes</u> Obesity <u>Statistical analyses</u> - Random-effects model - Between-study heterogeneity and between-subgroup heterogeneity was evaluated by I^2 and fixed-effect models, respectively. - Sensitivity analyses performed to evaluate the contribution of each study on the overall effect - Publication bias calculated using Begg's adjusted rank correlation test.	<u>Number of studies</u> 37 studies included (22 CS and 15 PCS), of which 2 PCS were conducted in participants aged 12 to 60 months at baseline (not included in the MA). The SR reported CS analyses for 1 of the PCS. Therefore, data from this PCS was not extracted in Annex 8, Table A8.1. <u>Number of participants</u> The PCS of interest included 589 participants <u>Age of participants</u> Participants were age 3 years at baseline and followed up for 3 years <u>Countries</u> HIC	<u>Results of interest for the age group covered in this report</u> 1 PCS (reported not association between DED and BMI z-score Food and beverages were used to calculate DED (as opposed to solid foods only or food and selected beverages for example, milk or energy-containing beverages) (See Annex 8, Table A8.1 for details)	<u>Risk of bias or quality</u> Newcastle-Ottawa Scale was used to score the quality of studies included in the MA only; the PCS of interest was not scored as these were not included in the MA. <u>Confounding factors</u> The PCS of interest performed multivariable analyses but further information on individual confounding factors not reported. <u>Limitations</u> (from the authors) Increased adiposity is a better predictor of obesity than BMI, which has several limitations (for example,, BMI fails to take into account the difference between fat and muscle mass. <u>AMSTAR overall confidence rating:</u> critically low

Te Morenga et al (2012) ‘Dietary sugars and body weight: systematic review and meta-analyses of randomised controlled trials and cohort studies’ Study design Systematic review with meta-analysis Funding University of Otago, the Riddet Institute (New Zealand) and the WHO Declaration of interest University of Otago, The Riddet Institute and the WHO; no other interests to declare	Research question Does reducing or increasing intake of dietary sugars influence measures of body fatness in adults and children? Search criteria *Search dates:* until December 2011 *Study design:* RCTs (≥2 weeks’ duration) and prospective cohort studies (≥1 year in duration). Trials of weight loss or confounded by additional medical lifestyle interventions were excluded. *Language:* not specified *Population*: adults and children free from acute illness, and those with diabetes or other non-communicable diseases in whom conditions were regarded as stable *Intervention or exposure and comparators:* intake of total sugars (sucrose, free sugars), a component of total sugar or sugar-containing foods or beverages Primary outcome Body fatness (at least one measure) Statistical analyses - Random effects model - Heterogeneity (Q test and I^2 statistic); a I^2 value >50% and p<0.05 was indicative of heterogeneity. - Publication bias (Egger’s test and funnel plot) - Sensitivity and meta-regression	Number of studies 68 studies (30 trials, 38 PCS), of which 7 PCS had participants aged 12 to 60 months at baseline. Number of participants Of the 7 studies of interest, samples ranged from 72 to 10,904 participants, with the majority of PCS including between 200 and 500 participants. Age of participants All the 7 studies of interest included children aged 1 to 5 years at baseline, with follow-up duration between 1 and 6 years. Countries HIC Exposure Most of the 7 studies of interest reported sugar exposure as sugar intake from beverages (SSB and fruit juice).	Main results (as reported in the SR) Association between SSB consumption and body fatness (7 estimates from 5 PCS, of which 5 estimates from 4 PCS are in children aged <60 months at baseline) - Increased risk of overweight or obesity among groups with the highest intake of SSB compared with those with the lowest intake (OR 1.55; 95%CI 1.32 to 1.82; p<0.001; I^2=0). - GRADE: low as all the studies were PCS; there was no further downgrading due to biases. See Annex 8, Table A8.2 for details.	Risk of bias or quality - RCTs assessed using Cochrane criteria and additional review-specific criteria including similarity, or not, of type and intensity of intervention in both arms, and whether studies were funded by industries with potentially vested interests. - GRADE assessment of the quality of evidence - Insufficient studies in children to investigate publication bias. Confounding factors - The authors noted a lack of consistency of the covariates used in the cohort studies to adjust analyses. - Of the studies of interest, all accounted for major confounders either by adjusting for covariates or by stratification. The most common confounders identified include age, dietary intake, sex, birth weight, some measure of socioeconomic status, parental or caregiver weight or body fatness measure Limitations (from the authors) - Most PCS reported effects largely or solely related to the consumption of SSB. - The authors noted that the term “added sugar” was sometimes used

Study	Methods	Included studies	Results	Comments
	analyses performed for RCTs only.			interchangeably with “free sugar” but does not include honey, syrups, or fruit juice. <u>Limitations</u> (from the review team) - Unclear which methods were used to assess the quality of cohort studies. <u>AMSTAR overall confidence rating:</u> moderate

Voortman et al (2015a) 'Effects of polyunsaturated fatty acid intake and status during pregnancy, lactation and early childhood on cardiometabolic health: a systematic review' <u>Study design</u> Systematic review <u>Funding</u> Nestle Nutrition (Nestec Ltd), Metagenics Inc and AXA <u>Declarations of interest</u> None	<u>Research question</u> What are the effects of PUFA intake and blood levels during pregnancy, lactation, or in early childhood up to the age of 5 years on cardiometabolic health? <u>Search criteria</u> *Search dates:* until 1 April 2014 *Study design:* intervention, cohort, CC or CS *Language:* no restrictions *Population:* exposure measure or intervention in healthy pregnant or lactating women, or in healthy children aged ≤5 years (outcome measures in the offspring at any age) *Exposure and comparators:* intake or blood levels of PUFAs, including total PUFAs, total n-3 FAs, total n-6 FAs, ratios between n-6 and n-3 FAs, fish oil, eicosapentaenoic acid (EPA), docosapentaenoic acid (DPA), docosahexaenoic acid (DHA), linoleic acid (LA), gamma-linolenic acid (GLA), dihomo-gamma-linolenic acid (DGLA), arachidonic acid (ARA) <u>Primary outcomes</u> Cardiovascular and metabolic outcomes, including obesity (BMI, weight-for-height, body fat), blood pressure (BP), blood lipids (TAG and total cholesterol, HDL and LDL cholesterol), measures of insulin sensitivity (glucose or insulin levels, HOMA, T2DM)	<u>Number of studies</u> 45 studies (19 trials, 24 PCS, 1 retrospective cohort study and 3 CS) reported in 56 publications, of which 2 RCTs and 7 PCS (reported in 8 publications) included children aged 12 to 60 months at baseline. <u>Number of participants</u> The 2 RCTs of interest included 100-133 participants; of the 7 PCS of interest 1 included <100 participants, 5 included between 100-500 participants and 1 included >2,500 participants. <u>Age of participants</u> Participants in the studies of interest were aged 6 months to 5 years at exposure, with most studies including children aged 12 to 18 months. Mean age at follow-up ranged from 1 to 5.8 years. <u>Countries</u> HIC, including 1 in the UK <u>Exposure</u> Of the 9 studies of	<u>Results of interest for the age group covered in this report</u> Association between PUFAs and measures of obesity (3 PCS) - 1 of 3 PCS reported an association between PUFA intake and a measure of obesity; 2 of 3 PCS reported no association (see Annex 8, Table A8.4 for details) n-3 FAs and BMI (2 RCTs, 1 PCS) - Neither RCT reported a significant effect of n-3 FA intake on BMI; the PCS also reported no association between n-3 FA and BMI (see Annex 8, Table A8.4 for details) PUFAs and blood lipids (1 RCT and 2 PCS) 1 PCS reported an inverse association between PUFA intake and HDL-C only. There was no reported relationship with all other outcomes examined (including total cholesterol, LDL-C, triacylglycerol) (see Annex 8, Table A8.5 for details) PUFAs and blood pressure (1 trial, 1 PCS) - Neither study reported a relationship between PUFA intake and blood pressure (see Annex 8, Table A8.6 for details) No studies were identified in children aged 12 to 60 months that assessed the relationship between dietary PUFA or blood	<u>Risk of bias or quality</u> - Study quality assessed using a predefined scoring system based on guidelines from the American Heart Association and American Diabetes Association. The scoring system has 5 items including study design, population size, exposure assessment or appropriate blinding of an intervention, and adjustment for potential confounders or adequate randomisation of an intervention. Quality score (QS) range is 0 to 10, with 10 representing the highest quality. <u>Confounding factors</u> Confounders identified by the authors that studies should have adjusted or matched for included age, sex, intake of total energy or other macronutrients, intake of micronutrients, blood levels of other fatty acids, physical activity, growth, birth weight, gestational age, maternal BMI, SES, ethnicity. <u>Limitations</u> (from the authors). Observational studies, also varied in the levels of adjustment for confounders. <u>AMSTAR overall confidence rating:</u> low

Study	Methods	Included studies	Results	Comments
		interest, 8 reported dietary n-3, n-6 or mixed PUFA intakes (%E, g per day, energy-adjusted g per day, %fat). - 1 PCS reported n-3 FA levels and n-6 or n-3 FA ratio in plasma phospholipids. - Of the 2 RCTs of interest, the intervention group in one trial received 1.6g fish oil for 9 months (vs sunflower oil), while the intervention group in the other trial received 500mg of DHA + EPA from oils, spreads and infant formula.	PUFA and measures of insulin sensitivity. The review authors concluded that “there was no clear detrimental or beneficial effects of PUFA intake or blood levels in pregnancy, during lactation, or in early childhood on obesity, blood pressure or blood lipids in children”.	

Study	Methods	Included studies	Results	Comments
Voortman et al (2015b) ‘Effects of protein intake on blood pressure, insulin sensitivity and blood lipids in children: a systematic review’ Study design Systematic review Funding Nestle Nutrition (Nestec Ltd), Metagenics Inc, and AXA Declarations of interest None to declare	Research question What are the associations of protein intake and blood pressure, insulin sensitivity and blood lipids in children? Search criteria *Search dates:* until 31 May 2013 *Search design:* CS, CC, cohort and intervention studies *Language:* no limits *Population:* children ≤18 years old; children with congenital diseases, phenylketonuria, type 1 diabetes or kidney disease were excluded *Intervention or exposure:* total, animal or vegetable protein intake Primary outcomes - BP: systolic or diastolic BP (mmHg); mean arterial pressure; hypertension - Insulin sensitivity: insulin levels; glucose levels; glucose tolerance; HOMA-IR; T2DM - Blood lipids: TC; HDL-C; LDL-C; TAG	Number of studies 56 studies (reported in 60 papers), of which 1 PCS included participants aged 12 to 60 months. Number of participants The PCS of interest included 389 participants Age of participants Participants were age 18 months at baseline and followed up at age 31 months Countries HIC	Results of interest for the age group covered in this report Protein intake and blood lipids The PCS of interest reported no association between protein intake and any of the blood lipids examined (total cholesterol, LDL-C, HDL-C, triacylglycerol) (see Annex 8, Table A8.11 for details) Protein intake and other health outcomes No studies in children aged 12 to 60 months identified	Risk of bias or quality - Quality of RCTs and cohort studies assessed using a 5-item questionnaire based on guidelines from the American Heart Association and American Diabetes Association. Items included study design, study size, exposure assessment, outcome assessment, adjustments for potential confounders or randomisation. The maximum possible quality score = 10. ‘Higher quality’ studies scored ≥6. - Evidence graded as ‘strong’, ‘moderate’, ‘limited’ or ‘insufficient’ depending on the number of studies, quality and consistency. Confounding factors - Potential confounders or mediators in the association between protein intake and cardiometabolic health were energy intake and measures of body weight or body fat. AMSTAR overall confidence rating: low

Micronutrients

Table A5.2. Evidence table – micronutrients

Study	Methods	Included studies	Results	Comments
Athe et al (2014) 'Impact of iron-fortified foods on Hb concentration in children (< 10 years): a systematic review and meta-analysis of randomized controlled trials' <u>Study design</u> Systematic review with meta-analysis of RCTs <u>Funding</u> National Institute of Nutrition (NIN), Indian Council of Medical Research, Hyderabad, India <u>Declaration of interest</u> None to declare	<u>Research question</u> To combine evidence from RCTs to assess the effect of iron-fortified foods on mean Hb concentration in children (<10 years). <u>Search criteria</u> *Search dates:* 1990 up to December 2010 *Search design:* RCTs *Language:* no restriction *Population*: children aged <10 years *Intervention and comparator:* various levels of iron fortification (including multiple intervention groups with other micronutrients administrated simultaneously) <u>Primary outcome</u> Hb concentration <u>Statistical analyses</u> - Random effect model. - Heterogeneity: *Q* statistic, variance (T^2) between studies, and I^2 parameter. - Publication bias: funnel plot and Egger regression test.	<u>Number of studies</u> 18 studies, of which 10 had participants aged 12 to 60 months at baseline. <u>Number of participants</u> 5142 participants included in MA <u>Age of participants</u> Mean age 4.7 years (SD 3.0) <u>Countries</u> Mainly LMIC <u>Intervention</u> - Daily iron intake through fortified food ranged between 3.5 and 12.7 mg per child, with intervention duration ranging between 4 and 24 months. - Half of the studies of interest used drinks as a food vehicle (milk: 2, water: 2, orange juice: 1), 3 used staples (maize, rice or rice-based dish) and 2 used snacks. The Fe compound used was mainly Ferrous sulfate.	<u>Main results as reported in the SR</u> Hb concentration (18 studies, n=5142) - Mean change significantly higher in the Fe-fortified group than in the control: WMD 5.09g/l (95% CI 3.23 to 6.95; p<0.00001). - No adverse effect reported. - Meta-regression: duration of intake of fortified food is an effective confounder. - After removal of confounders (including study duration): WMD 4.74g/l (95% CI 3.08 to 6.40). - Probable absence of publication bias. Significant heterogeneity: - systematic underlying differences (*Q* statistic), that could be due, in part, to studies with n<30. - heterogeneity among trials (T^2 and I^2).	<u>Risk of bias or quality</u> - Individual study quality assessed, probably based on Cochrane Handbook, but details provided only on 2 criteria (concealment of allocation and blinding) - No additional information or discussion provided on study quality, except in the conclusion were a need for higher quality and more rigorous randomised controlled trials was highlighted. <u>Confounding factors</u> - The influence of confounding factors such as age, duration of intervention and levels of fortification was assessed through meta-regression analysis. - Duration of intervention was identified as a confounder (details not reported). <u>Limitations</u> (from the review team) Findings were not stratified by baseline nutritional status <u>AMSTAR overall confidence rating:</u> low

Study	Methods	Included studies	Results	Comments
Das et al (2013) ‘Micronutrient fortification of food and its impact on woman and child health: a systematic review’ Study design Systematic review with meta-analysis of RCTs Funding Not specified Declaration of interest None to declare	Research question To assess the effectiveness of food fortification with single micronutrients (iron, folic acid, vitamin A, vitamin D, iodine, zinc, calcium) as well as multiple micronutrients (MMN) when compared with no fortification on the health and nutrition of women and children. Search criteria *Search dates:* up to November 2012 *Search design:* RCTs, quasi-experimental and before-after studies; other studies designs (for example, observational) were also reviewed to understand the context of these interventions *Language:* no restriction *Population*: infants, children, adolescents <18 years old (and women of reproductive age and post-menopausal women) *Intervention:* impact of fortification intervention with a single, dual or multiple micronutrients administrated through 3 food vehicles: staples, condiments, or processed foods (excluded: home fortification, biofortification, comparison between fortification and supplementation, etc) *Comparators:* unfortified foods or regular diet Primary outcomes	Number of studies 201 studies (125 RCTs, 7 quasi experimental and 69 before-after studies). Although subgroup analyses were conducted in preschool and school children (aged 2 to 18 years) for most intervention groups (single and multiple micronutrients), only findings from MAs on vitamin A fortification were substantially weighted towards children aged 12 to 60 months (>50% weighting of MAs. Therefore, only findings on vitamin A fortification were extracted here and in Annex 8, Tables A8.19 and 8.21. Countries HIC, UMIC, LMIC Intervention Vitamin A - food vehicle: biscuits, monosodium glutamate, sugar, flour and seasoning. - Duration: all studies >6 months.	Results of interest for the age group covered in this report Vitamin A fortification Hb levels (SMD; GRADE: low) - Combined effect: (0.48; 95% CI: 0.07 to 0.89; I^2=93%; 2 studies, 1538 participants of which 1 study, with 73.5% weighting in the MA, included children aged 3 to 6 years) Serum vitamin A concentration (SMD; GRADE: low) - Combined effect: (0.61; 95% CI: 0.39 to 0.83; I^2=84%; 3 studies, 2362 participants, of which 1 study, with 55.5% weighting in the MA, included children aged 3 to 6 years) Vitamin A deficiency (RR; GRADE: moderate) - Combined effect: (RR 0.39; 95% CI 0.09 to 1.74; p=0.22; I^2=88%; 2 studies, 1465, of which 1 study, given 70.9% weighting in the MA, included children aged 3 to 6 years) For more details, see Annex 8, Tables A8.19 to A8.21.	Risk of bias or quality - RoB assessed through Cochrane Collaboration tool, including sequence generation, allocation concealment, blinding and selective outcome. - GRADE approach used to assess the quality of the evidence for each outcome. Confounding factors - The review authors reported that limited information was available on confounding factors such as age and nutritional status. Limitations (from the authors) - As large-scale fortification programs are usually before-after studies, a range of studies of varying sizes and scientific rigour had to be included, resulting in many limitations. - Foods used, micronutrient concentrations, frequency of intakes, and duration of the intervention periods varied across studies - Limited information available on the impact of fortification on anthropometric measures, morbidity and mortality, which are essential to evaluate future benefits and effective strategies.

Study	Methods	Included studies	Results	Comments
	- biochemical indicators (for example, serum micronutrient levels) - haematologic markers (anaemia, IDA, Hb) - anthropometric indicators (stunting, wasting, underweight, and changes in height and weight z-scores) - relevant morbidity and mortality definition used: • anaemia: 6-59 months: Hb<110g/l • vitamin A deficiency: plasma (serum) retinol concentration <20µg/dl • zinc deficiency: serum zinc concentration <10.7µmol/l • asymptomatic zinc deficiency: <10.7µmol/l without clinical signs or symptoms. Statistical analyses - Separate MA performed for RCTs or quasi experimental studies, and before-after studies (results of before-after MA were reported only if no RCTs or quasi-experimental studies were available). - Random-effects model - Heterogeneity: I^2 statistic, chi-square test and visual inspection of forest plots. - Subgroup analyses: age groups, countries, population characteristics, type of food fortified, and duration of intervention.			Limitations (from the review team) - Although the review authors declared that they had no competing interests, they noted that they "are grateful to the Nestle Nutrition Institute for its unrestricted support towards the genesis of this review and its external assessment in an advisory group meeting in Zurich in October 2011". - Multiple planned subgroup analyses were not reported or performed - Risk of publication bias was not investigated. - Findings were not stratified by baseline nutritional status AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
De-Regil et al (2011) 'Intermittent iron supplementation for improving nutrition and development in children under 12 years of age' Study design Systematic review with meta-analysis of RCTs or quasi-randomised trials (Cochrane) Funding *Internal sources*: Centers for Disease Control and Prevention (CDC), US, and World Health Organization (WHO), Switzerland. *External sources*: 1 author received partial financial support from WHO for this review, and the WHO received financial support from the Government of Luxembourg for conducting SR on micronutrient interventions.	Research question To assess the effects of intermittent iron supplementation, alone or in combination with other vitamins and minerals, on nutritional and developmental outcomes in children less than 12 years of age compared with daily supplementation, a placebo or no supplementation. Search criteria *Search dates*: up to June 2011. *Study design*: Randomised and quasi-randomised trials with either individual or cluster randomisation *Language*: no restriction *Population*: children under the age of 12 years at the time of intervention with no specific health problems *Interventions*: intermittent iron supplementation compared with a placebo, no intervention or daily supplementation; iron supplements combined with co-intervention were included if the co-intervention was the same in both the intervention and the control groups *Comparators*: 6 different comparisons were performed, 2 of them for children aged 0 to 59 months: any intermittent iron supplementation versus no supplementation or placebo, and versus daily iron supplementation Primary outcomes - Anaemia (haemoglobin below a	Number of studies 33 trials included, 20 included participants aged under 5 years. Of the 20, 13 included participants aged 12 and 60 months. Countries LMIC Interventions - Most of the trials (including the 13 of interest) provided weekly doses between 25 and 75mg of elemental iron, either alone, with folic acid or with other micronutrients (for example vitamins A, C or D, or zinc). - Nearly half of the trials had a duration of 3 months or less, and half of more than 3 months.	Results of interest for the age group covered in this report Any intermittent iron supplementation versus no supplementation or placebo (0 to 59 months of age): Anaemia: RR 0.43; 95% CI 0.23 to 0.84 (4 trials, 658 participants). Subgroup analyses by anaemia status at baseline: anaemic children (RR 0.61; 95% CI 0.49 to 0.74; 1 trial, 307 participants); non-anaemic (0 trial); mixed or unknown (RR 0.26; 95% CI 0.07 to 1.03; 3 trials, 351 participants). Haemoglobin (g/l): MD 6.45; 95% CI 2.36 to 10.55 (9 trials, 1254 participants). Subgroup analyses by anaemia status at baseline: anaemic children (MD 8.0; 95% CI 5.00 to 11.00; 1 trial, 307 participants); non-anaemic (0 trial); mixed or unknown (MD 6.25; 95% CI 1.60 to 10.90; 8 trials, 947 participants). ID: RR 0.24; 95% CI 0.06 to 0.91 (3 trials, 431 participants). Ferritin (µg/l): MD 13.15; 95% CI -2.28 to 28.59 (4 trials, 310 participants). Subgroup analyses by anaemia status at baseline: anaemic children (0 trial); non-anaemic (NS; 1 trial, 74 participants); mixed or unknown (NS; 3 trials, 236 participants). - Adherence: RR 1.04; 95% CI 0.98 to 1.09 (2 trials, 289 participants).	Risk of bias or quality - RoB assessed using the criteria outlined in the Cochrane Handbook for systematic reviews of interventions. - The authors considered that indirectness or publication bias was unlikely but the quality of the trials and inconsistency (or the lack of studies) were potentially important factors in the overall assessment of the evidence. Confounding factors - The authors noted that in some studies there was some baseline imbalance on potential confounders in terms of participants characteristics. Limitations (from the authors) - 75% of the included trials had a sample size of less than 500 children and the trials often lacked blinding and a clear description of randomisation methods. - Baseline anaemia and iron deficiency status varied across studies; most were conducted in settings with a high prevalence of anaemia. - Insufficient studies to allow the authors to evaluate in detail all the outcomes of interest and by subgroups. - Lack of data to meaningfully examine adherence and

Study	Methods	Included studies	Results	Comments
Declaration of interest None to declare. *Disclaimer*: 3 of the authors have worked or received financial support from the WHO and the 4th author is a full-time staff member of the CDC.	cut-off defined by trialists) - Haemoglobin (g/l) - ID (as measured by trialists by using indicators of iron status, such as ferritin or transferrin) - Iron status (ferritin in µg/l) - IDA (defined by the presence of anaemia plus iron deficiency, diagnosed with an indicator of iron status selected by trialists) - All cause mortality (number of deaths during the trial) Meta-analysis - Random-effects model - For outcomes with 4 trials or more, subgroup analysis carried out to investigate heterogeneity (I^2). Subgroups included weekly dose of iron, duration of supplementation, type of compound, anaemia status at baseline, intermittent supplementation regimen, participants sex, and micronutrient composition. - Sensitivity analysis carried out to examine the effects of high risk of bias studies.		Any intermittent iron supplementation versus any daily iron supplementation (0 to 59 months of age): Anaemia: RR 1.26; 95% CI 1.05 to 1.51 (3 trials, 770 participants). Haemoglobin (g/l): MD -0.75; 95% CI -1.80 to 0.29 (14 trials, 2,270 participants). Subgroup analyses by anaemia status at baseline: anaemic children (NS; 5 trials, 834 participants); non-anaemic (NS; 2 trials, 113 participants); mixed or unknown (MD -1.20; 95% CI -2.20 to -0.19; 7 trials, 1,323 participants). ID: RR 4.00; 95% CI 1.23 to 13.05 (1 trial, 76 participants). Ferritin (µg/l): MD -3.10; 95% CI -6.59 to 0.39 (8 trials, 589 participants). Subgroup analyses by anaemia status at baseline: anaemic children (NS; 4 trials, 225 participants); non-anaemic (NS; 3 trials, 167 participants); mixed or unknown (NS; 2 trials, 190 participants). Adherence: RR 1.29; 95% CI 1.15 to 1.45 (3 trials, 1,185 participants).	adverse effects specifically related to intensity and frequency of dosing. Limitations (from the review team) - It was not possible to disaggregate findings in children younger and older than 12 months of age. AMSTAR overall confidence rating: high

Study	Methods	Included studies	Results	Comments
Domellöf et al (2013) 'Health effects of different dietary iron intakes: a systematic literature review for the 5th Nordic Nutrition Recommendations' <u>Study design</u> Systematic review of primary studies and SR <u>Funding</u> The Nordic Council of Ministers <u>Declaration of interest</u> None to declare	<u>Research questions</u> (1) What is the minimal dose of dietary iron intake that will prevent poor functional or health outcomes in different age groups within the general population including the risk groups for ID? (2) What is the highest dose of dietary iron intake that is not associated with poor functional or health outcomes in different age groups within the general population including some risk groups for iron overload? <u>Search criteria</u> *Search dates*: January 2000 to December 2011 *Study design*: published papers, excluding letters, news article, congress reports and non-systematic review *Language*: Nordic or English *Population*: No limitation on age (infants, children, pregnant women and adults included), healthy humans of relevance to the research question; population relevant for Nordic countries (excluding populations from LMIC in Africa, South America and Asia) *Intervention and comparator*: 'of relevance to the research questions' <u>Primary outcomes</u> - Anaemia - Cognitive or behavioural function - Growth and development	<u>Number of studies</u> 55 articles, 3 included participants aged 1 to 5 years (2 PCS and 1 SR with MA – Ramakrishnan et al, 2009, which was separately identified and included in this report). <u>Age of participants</u> Up to 24 months for the 2 PCS, up to 5 years for the SR or MA. <u>Number of participants</u> Total not specified. n=74 and 94 for the 2 cohort studies. 27 trials included in the SR or MA. <u>Countries</u> Mostly HIC <u>Interventions</u> - In 1 PCS, the exposure was dietary iron intake and the outcome was prevalence of IDA; in the other PCS, the exposure was dietary iron intake and cows' milk intake and the outcome was iron status. - In the SR or MA, intervention was iron	<u>Results of interest for the age group covered in this report</u> Anaemia and iron status – young children (2 PCS) - Both PCS reported a lower iron intake than recommended in children aged 9 to 24 months, but the prevalence of IDA was low at age 24 months. - 1 PCS reported a significant association between cows' milk intake >500mlday and ID (50% vs 2%, p<0.001). Child growth (1 MA) No significant effect of iron supplementation on growth in children <5 years of age (but children were not stratified by initial iron status). Physical performance; cognitive and behavioural function; hypertension and cardiovascular disease; diabetes mellitus; cancer No studies conducted in young children were identified. <u>Other results</u> The SR also reported on the interactions between iron and other food components - No conclusive evidence (in all age groups) that iron supplements affect zinc or copper absorption. - Tea (in 2 reviews that included 6 studies in infants and children, n=2942). No need to advise any restrictions on tea drinking in healthy people with no risk of ID.	<u>Risk of bias or quality</u> - Study quality assessed using QAT, which includes questions about study design, recruitment, compliance, dietary assessment, confounders, statistics and outcomes. - Studies were graded A (low RoB), B or C (high RoB). Studies graded C were not used in the final grading of the evidence and were not reported in evidence tables. <u>Confounding factors</u> - Most of the studies on infants and children (included the 3 of interest) did not report on confounding factors. <u>Limitations</u> (from the authors) None reported. <u>Limitations</u> (from the review team) - In relation to the grading of evidence, only the final grade (A, B, C) was provided for each reference, without details about which bias had each study. - The authors assessed and graded the evidence for both infants and children, as one group. It was therefore not possible to report a grading of the evidence for young children only.

Study	Methods	Included studies	Results	Comments
	- Adverse effects, including the possible risk of cancer and cardiovascular disease	supplementation, with most common dose being 10 mg per day and duration between 2 and 12 months.	In groups at risk of ID, the advice should be to drink tea between meals (at least 1h after eating).	- Findings were not stratified by baseline nutritional status AMSTAR overall confidence rating: low

Study	Methods	Included studies	Results	Comments
Eichler et al (2012) 'Effect of micronutrient fortified milk and cereal food for infants and children: a systematic review' <u>Study design</u> Systematic review with meta-analysis of RCTs <u>Funding</u> Supported by the Nestle Nutrition Institute <u>Declaration of interest</u> None to declare	<u>Research question</u> To specifically assess the impact of micronutrient fortified milk and cereal food on the health of infants and children compared to non-fortified food in RCTs. <u>Search criteria</u> *Search dates:* up to February 2011 *Search design:* RCTs of any follow-up time *Language:* no restriction *Population*: infants and children from 6 months to 5 years of age (primary focus was up to 2 years old, but higher upper limit was set in order not to miss suitable studies with mixed age groups) *Intervention and comparators:* micronutrient fortified milk or cereal foods *Comparators:* non-fortified food; additional other nutritional approaches if such approaches were applied in both groups <u>Primary outcomes</u> - Micronutrient serum levels - Haematological parameters - Functional outcomes (for example, motor development) - Measure of morbidity (for example, disease rates) or mortality <u>Statistical analyses</u>	<u>Number of studies</u> 18 studies, of which 6 had participants aged 12 to 60 months at baseline (mean age at baseline <12 months for the 12 other studies). Mean age at inclusion ranged from 6 to 23 months (upper age limit was 3 years in 1 study). Only findings from MAs on vitamin A fortification were substantially weighted towards children aged 12 to 60 months (>50% weighting of MAs. Therefore, only findings on vitamin A fortification were extracted here and in Annex 8, Table A8.19. <u>Countries</u> Mainly UMIC and LMIC <u>Intervention</u> - Most participants belonged to vulnerable groups and were recruited from different settings (for example, medical or care centres, low income risk groups). - Follow-up periods were generally short and did not exceed one year (for all studies	<u>Results of interest for the age group covered in this report</u> Effect of vitamin A (dual and multiple micronutrient) on retinol levels (4 RCTs, aged 6m to 3 years at baseline) - 3.7µg/dl; 95% CI 1.3 to 6.1; I^2=37%; 4 RCTS, participants and interventions NR, % weighting in children aged 1 to 5 years NR) See Annex 8, Table A8.19 for details.	<u>Risk of bias or quality</u> - RoB assessed through Cochrane Collaboration tool, including generation of random sequence, allocation concealment, blinding, incomplete outcome data due to attrition, and selective outcome. <u>Confounding factors</u> - The authors did not comment on confounding factors. - A multivariable meta-regression analysis was performed but not on outcomes relating to children in the age group of interest to this report. <u>Limitations</u> (from the authors) - Included studies had short follow-up durations, thus the impact of fortified milk or cereal food on functional health outcomes could not be assessed thoroughly. - Pooled estimates have to be interpreted cautiously as statistical heterogeneity between studies was considerable. Possible sources for unexplained heterogeneity might be underreporting for co-interventions or the diversity of applied preparations that have influence on micronutrient absorption.

Study	Methods	Included studies	Results	Comments
	- Random effects model - Heterogeneity: I^2 statistic - Prespecifed subgroup analyses: fortified milk vs cereal foods, HIC vs LMIC, single vs dual vs multiple micronutrient fortification. - Meta-regression analysis performed to evaluate the unique contribution of other independent factors (chosen a priori) on the most often reported outcome (dependent variable: Hb level; independent variables: Hb levels before intervention; daily amount of fortified micronutrient; length of follow-up; completeness of follow-up).	included in the SR, mean follow up: 8.2 months; range: 2.3 to 12). - Fortified milk was prepared with centrally-processed fortified milk powder in most of the studies. Fortified cereals comprised centrally-processed complementary baby food, such as fortified porridge, gruel or weaning rusk to prepare a pap.		Limitations (from the review team) - Findings were not stratified by baseline nutritional status - Publication bias not investigated. AMSTAR overall confidence rating: low

Study	Methods	Included studies	Results	Comments
Hojsak et al (2018) 'Young Child Formula: A Position Paper by the ESPGHAN Committee on Nutrition' Study design Systematic review of observational and intervention studies Funding None specified Declaration of interest Various authors declared that they received funding from industry (Nestle, Danone, Nutricia)	Research question To review the composition of young child formula (YCF) and consider their role in the diet of young children Search criteria *Search dates:* up to January 2017 *Study design:* human studies *Language:* English *Population:* children aged 0-18 years *Intervention or exposure and comparators:* YCF Primary outcomes Outcomes were determined that may identify any possible beneficial effect of YCF, and to review available data on the composition of YCF.	Number of studies 19 studies (7 RCTs, 1 cluster-RCT, 10 CS and 1 simulation study), of which 17 included participants aged 12 to 60 months at baseline. Of these, 3 RCTs and 1 cluster-RCT (reported in 6 publications) examined the association between YCF and health. Two RCTs that examined the effect of YCF on iron status were included in more comprehensive SRs included in this report. Their findings on iron status have not been extracted under this SR. Countries Mostly HIC Outcomes Outcomes of interest to this report: - vitamin D status - zinc status - serum IgA	Results of interest for the age group covered in this report Vitamin D status (3 RCTs) All 3 studies reported that vitamin D-fortified YCF improved vitamin D status (See Annex 8, Table A8.23 for details). Blood zinc concentrations (1 RCT) The RCT reported no differences in serum zinc concentrations among children randomised to receive YCF fortified with zinc and other micronutrients, red meat or nonfortified cows' milk Immunoglobulin A (IgA) (1 cluster-RCT) 1 cluster-RCT reported an increase in IgA with YCF supplemented with synbiotics (*Lactobacillus paracasei* NCC2461 and *Bifidobacterium longum* NCC3001; inulin and fructo-oligosaccharides) and vitamins (A, C, and E), minerals (zinc and selenium), and docosahexaenoic acid compared with regular YCF. The study was funded by Nestle.	Risk of bias or quality Quality assessment of studies was not performed. Confounding factors No mention of confounding factors or adjustment for these Limitations (from the authors) None reported Limitations (from the review team) - Literature search not comprehensive for vitamin D as an exposure or intervention - Publication bias not assessed - 2 of the 5 studies of interest reported on the same RCT - Findings were not stratified by baseline nutritional status AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Imdad et al (2017) 'Vitamin A supplementation for preventing morbidity and mortality in children from six months to five years of age' Study design Systematic review with meta-analysis of RCTs Funding The WHO Declaration of interest The authors alone are responsible for the opinions and views expressed in this publication. Imdad was paid for writing this review by the WHO. Evan Mayo-Wilson - none known. Bhutta's institution received a grant from the WHO for this review and two additional vitamin A related Cochrane reviews (Imdad 2016; Haider 2017). Bhutta is an Editor for Cochrane Developmental, Psychosocial and Learning Problems.	Research question To assess the effect of vitamin A supplementation (VAS) compared to placebo or no intervention for preventing morbidity and mortality in children aged 6 months to 5 years. Search criteria *Search dates:* up to March 2016 *Study design:* RCTs and cluster-RCTs *Language:* no language limits applied *Population*: children aged 6 months to 5 years; hospitalised children and children with disease or infections were excluded. *Intervention and comparators:* synthetic VAS compared to placebo or treatment-as-usual control group, including various doses and frequencies; co-interventions must have been identical in both groups to be included; food fortification, consumption of foods rich in vitamin A, and beta-carotene supplementation were excluded. Primary outcome All-cause mortality (not of interest to this report) Secondary outcomes Of interest to this report	Number of studies 47 RCTs (42 included in MAs) Number of participants Total n=1,223,856 Studies ranged from 35 participants to over 1 million. The median % of boys in the studies was 51%. Age of participants All studies were on participants aged 6 months to 5 years. 21 (44%) studies reported average age, which was 33 months across the studies. Countries LIC, LMIC and UMIC Intervention All studies used large doses of vitamin A in the range of 50,000 IU to 200,000 IU (1 IU = 0.3mcg), depending on the age of participants, except for 5 studies that used smaller doses (3866-25,000 IU). Participants received the large doses (50,000 IU to 200,000 IU) every 4 to 6 months, either once or more,	Results of interest to this report Vitamin A deficiency (4 trials; 2262 participants; mean follow-up: 54.5 weeks) - RR 0.71; 95% CI 0.65 to 0.78; I^2=78% (GRADE: moderate) Vitamin A serum retinol levels at follow-up (14 trials) - SMD 0.26; 95% CI 0.22 to 0.30; I^2=95% - Random-effects model: SMD 0.50; 95% CI 0.30 to 0.70 - Funnel plot highly asymmetrical Bitot's spots - incidence (1 trial): no effect reported (RR 0.93; 95% CI 0.76 to 1.14) - prevalence (5 trials; 1,063,278 participants; mean follow-up: 80.72 weeks): RR 0.42; 95% CI 0.33 to 0.53; I^2=49% (GRADE: moderate) Night blindness - incidence (1 trial): RR 0.53; 95% CI 0.28 to 0.99 - prevalence (2 trials; 22,972 participants; follow-up: 52 to 68 weeks): RR 0.32; 95% CI 0.21 to 0.50; I^2=0% (GRADE: moderate) Xerophthalmia - incidence (3 trials): not significant - prevalence (2 studies): RR 0.31 (95% CI 0.22 to 0.45; I^2=0%). See Annex 8, Tables A8.18 and A8.20 for more details.	Risk of bias or quality - RoB assessed using Cochrane's tool. - Quality of evidence for primary outcome (GRADE): high. Confounding factors - Authors noted that the magnitude of the effect may differ across settings and populations (possibly due to the extent of VAD), concomitant nutrient deficiencies may impair bioavailability of the supplements, and comorbid illnesses may reduce absorption of vitamin A. Limitations (from the authors) - The authors combined risk ratios (events per child) and rate ratios (events per child-year) for incidence data but noted that this was not ideal. - Subgroup analyses were vulnerable to reporting bias (differences more likely to be reported than similarities). -Secondary analyses were more likely to be influenced by missing data than primary outcome. - Out of 47 studies, 20 excluded children with VAD but vitamin A status was unclear in 23.

Study	Methods	Included studies	Results	Comments
	- Bitot's spots, night blindness, xerophthalmia - Vitamin A deficiency (VAD) status Statistical analyses - Fixed-effects model - Heterogeneity (visual inspection of forest plots, Chi^2 test and I^2 statistic) deemed to be substantial if Chi^2 $p<0.10$ and $I^2> 50\%$. - Subgroup analyses (dose, frequency, geographical location, sex, age (6 to 12 months vs 1 to 5 years) - Sensitivity analyses: • test for bias (for studies at high RoB for sequence generation) • small study bias using random-effects model and funnel plots (for outcomes with ≥10 outcomes) • robustness of results when using imputed intracluster correlation coefficients.	depending on the study duration. Studies that used smaller doses gave more frequent doses. Intervention duration 5 studies continued for 5 years or more, the remainder of the studies lasted about 1 year or less.		- A general weakness of many of the included interventions was the under-reporting of implementation data, such as the core components of an intervention, the degree to which they are delivered in practice, and what aspects of the trial may have influenced implementation. - Findings were not stratified by baseline nutritional status AMSTAR overall confidence rating: high

Study	Methods	Included studies	Results	Comments
Matsuyama et al (2017) ‘Effect of fortified milk on growth and nutritional status in young children: a systematic review and meta-analysis’ <u>Study design</u> Systematic review and meta-analysis <u>Funding</u> No specific grant from any funding agency in the public, commercial or not-for-profit sectors. One author is partially funded by Danone Nutricia. <u>Declarations of interest</u> None to declare	<u>Research question</u> To assess the effect of fortified milk on growth and nutritional status in young children <u>Search criteria</u> *Search dates:* to June 2014 *Study design:* RCTs of minimum 4 months duration *Population:* healthy children aged 6 to 47 months *Intervention:* fortified milk or formula with micronutrients or prebiotics, probiotics or synbiotics, or had modified macronutrient content *Comparators:* Non- (or low-) fortified milk or formula. <u>Primary outcomes</u> - Body size (for example, weight, height or length, BMI, head circumference) - body composition - biochemical markers <u>Statistical analyses</u> - MA conducted for the age group 6 to 47 months. - Random-effects model used for studies with $I^2>0{\cdot}40$. - RoB assessed through funnel plot. - Subgroup analyses: study country’s economic status, the intervention duration and the age of participants.	<u>Number of studies</u> 15 publications (reporting on 12 RCTs). Of these, 10 publications (7 RCTs) included participants aged 12 to 60 months. To note 1 RCT was included in most of the SRs identified on iron. <u>Intervention</u> - Duration ranged from 5 to 12 months. - Most common fortificants (of interest to this report): Fe and vitamin C, followed by Zn, vitamin D - Other fortificants: long chain polyunsaturated fatty acids (LC-PUFA) and prebiotics, probiotics or synbiotics. - Control milk varied from standard cows’ milk to no- or low-fortified ‘follow-on-formula’. <u>Countries</u> HIC, UMIC and LMIC	<u>Results of interest to this report</u> Iron biomarkers See Annex 8, Table A8.12 for detailed results on Hb, serum ferritin, anaemia, including subgroup analyses for anaemia in children aged >12 months at baseline (only outcome for which subgroup analyses were reported in the SR). Other Fe status outcomes (not extracted in detail in Annex 8) - Body iron (1 study): higher in multiple micronutrient (MMN) intervention group compared with control - Zinc protoporphyrin, haematocrit and red-cell distribution (1 study): improvement reported in MMN intervention group compared with control - Mean corpuscular volume (2 studies): improvement in 1 study (UK, MMN fortification), no difference in the other (Sweden, dual fortification with iron + vitamin C) Serum zinc (5 RCTs) - Zn fortified milk did not result in significant change in serum Zn concentration in any of the studies. Body size outcomes Findings not extracted because trials tested milk fortified with LC-PUFA or prebiotics or synbiotics	<u>Risk of bias or quality</u> - RoB assessed using Cochrane tool. - Funnel plot for anaemia showed symmetry, suggesting minimal publication bias. - Certainty of evidence not graded. <u>Confounding factors</u> Most studies reported any baseline imbalance between groups (number of participants between groups, potential baseline imbalances) but none were deemed sufficiently extreme to have impacted the study outcome significantly. <u>Limitations</u> (from the authors) The operational definition of anaemia was not uniform, but mostly based on Hb concentration of <110 g/l. <u>Limitations</u> (from the review team) - Results that were not statistically significant were not reported. - Findings not stratified by baseline nutritional status - Subgroup analyses only reported for body size outcomes and anaemia <u>AMSTAR overall confidence rating:</u> moderate

Study	Methods	Included studies	Results	Comments
Mayo-Wilson et al (2014b) ‘Zinc supplementation for preventing mortality, morbidity, and growth failure in children aged 6 months to 12 years of age’ <u>Study design</u> Systematic review with meta-analysis of RCTs (Cochrane) <u>Funding</u> Aga Khan University (Pakistan) and the Centre for Evidence-Based Intervention (UK). <u>Declaration of interest</u> 2 authors (Imdad and Bhutta) have published previous reviews on zinc; 1 author (Bhutta) was involved in some of the trials included in this review but has not participated to the data extraction of these trials.	<u>Research question</u> To assess the effects of zinc supplementation for preventing mortality and morbidity, and for promoting growth, in children aged 6 months to 12 years old. <u>Search criteria</u> *Search dates:* up to January 2013 *Study design:* RCTs and cluster-RCTs with a parallel group design; quai-RCTs excluded *Language:* not specified *Population*: children aged 6 months to 12 years at baseline; hospitalised children and children with chronic diseases or with conditions that could affect growth were excluded *Intervention and comparators:* preventive oral zinc supplementation compared with no intervention, a placebo or a waiting list control; food fortification or intake, sprinkles, and therapeutic interventions excluded; co-interventions were included if the same co-intervention were administrated to both groups; comparisons of iron + zinc versus zinc alone were also included in order to evaluate the effect of providing zinc and iron simultaneously. <u>Primary outcomes</u>	<u>Number of studies</u> 80 RCTs, of which about 50 had participants aged 12 to 60 months. Most of the participants in the review were under 5 years of age; the median of the reported mean age was 28 months. <u>Countries</u> 73 (91%) studies were conducted in LMIC, mainly from Asia and Latin America. <u>Intervention</u> - Studies for which the formulation of zinc was reported: zinc was provided as a solution or syrup (46), pill or tablet (17), capsule (6), or powder (2). - Studies reporting the chemical compound of their zinc supplements provided zinc as sulfate (45), gluconate (12), acetate (6), and other compounds (8). - Studies provided zinc for <2 months (8), 2 to <6 months (22), 6 to <12 months (33), and ≥12 months (16).	<u>Results of interest to this report</u> Zinc versus no zinc See Annex 8, Table A8.17 for detailed results of main MA and subgroup MA in children aged 1 to <5 years for the following: - Growth (height, weight, weight-to-height ratio) - Blood zinc concentration - Risk of zinc deficiency - Blood Hb and ferritin concentrations - Prevalence of anaemia and iron deficiency Zinc plus iron versus zinc alone Findings for this comparison were not stratified by age group and therefore are not specific to children aged 1 to 5 years. See Annex 8, Table A8.17 for results for the following: - Growth (height, weight, weight-to-height ratio) - Zinc status - Iron status	<u>Risk of bias or quality</u> - RoB assessed using Cochrane tool. - GRADE used to assess certainty of evidence for primary outcomes - No publication bias detected for primary outcomes (funnel plots) <u>Confounding factors</u> - The authors did not comment on confounding factors (review of RCTs). However, they did comment on factors that might impact the effectiveness of zinc supplementation, such as meat intake, level of undernutrition, levels of fibre and phytate consumption, disease prevalence and pathogen profiles. <u>Limitations</u> (from the authors) - As most of the studies were conducted in LMIC, results might not be applicable to HIC. - Studies of zinc with an iron co-intervention versus those without were analysed, but the review was not primarily designed to explore this relationship fully. - The authors noted that the evidence for secondary outcomes and adverse events was more mixed, that heterogeneity was significant for some of these outcomes which remains largely unexplained and that they were

Study	Methods	Included studies	Results	Comments
(Mayo-Wilson et al, 2014a), identified through the literature search, reported on the same systematic review and has therefore not been extracted into evidence table.	- All-cause mortality and cause-specific mortality due to all cause diarrhoea, LRTI and malaria (not of interest to this report) Secondary outcomes of interest to this report: growth, micronutrient status and adverse events. Statistical analyses - Fixed-effects model - Heterogeneity (visual inspection forest plots, Chi^2 test and I^2 statistic) deemed to be substantial if Chi^2 p<0.10 and I^2> 50% - Subgroup analysis conducted for outcomes with ≥10 studies, including country income level, age (6 to <12 months vs 1 to <5 years vs 5<13 years) dose and iron co-intervention. - Planned sensitivity analyses: • random-effects model • test for bias (for studies at high RoB for sequence generation) – not performed • robustness of results when using imputed ICCs – not performed - Publication bias (funnel plots) assessed for MA with ≥10 studies	- Zinc was provided daily in 48 studies and 11 provided zinc weekly. - Studies that could be classified based on zinc dose administered daily dose equivalents of <5 mg (5), 5 mg to <10 mg (19), 10 mg to <15 mg (30), 15 mg to <20 mg (8), and ≥20 mg (12). - 20 trials were factorial. Among both factorial and non-factorial trials, there were 100 eligible comparisons. Of these eligible comparisons, 51 (49%) included a co-intervention that both the zinc and the control groups received. Common co-interventions were iron, vitamin A, or multivitamin supplements.		more likely to be influenced by selective reporting. Limitations (from the review team) - Findings were not stratified by baseline nutritional status - Outcomes not directly relevant to UK population were not extracted, including the primary outcome ‘mortality due to malaria’ and the secondary outcomes related to malaria and stunting. - Only the subgroup analyses for age, iron co-intervention and country income level (where available) were extracted. - The authors did not conduct sensitivity analyses to assess the potential impact of RoB in individual studies on the results of the meta-analyses. AMSTAR overall confidence rating: moderate

Study	Methods	Included studies	Results	Comments
Pasricha et al (2013) 'Effect of daily iron supplementation on health in children aged 4-23 months: A systematic review and meta-analysis of randomised controlled trials' <u>Study design</u> Systematic review with meta-analysis of RCTs <u>Funding</u> Supported by grants from the Government of Victoria, the Royal Australasian College of Physicians and the University of Melbourne (Australia) <u>Declaration of interest</u> None to declare	<u>Research question</u> To comprehensively assess the effect of daily iron supplementation in children aged 4–23 months on important haematological and non-haematological outcomes and adverse effects. <u>Search criteria</u> *Search dates*: until February 2013 *Study design*: RCTs *Language*: no language restriction *Population*: healthy children aged 4 to 23 months (or at least 75% of participants within the designated age range) *Interventions and comparators*: daily oral iron supplements versus control; iron supplements combined with a second intervention included if co-intervention applied identically (without iron) in the control group <u>Primary outcomes</u> - Haemoglobin (g/l) - Anaemia (defined by study investigators) - Iron status (iron indices, including ferritin) - Iron deficiency, ID (defined by study investigators) - Iron deficiency anaemia, IDA (defined by study investigators) - Cognitive and psychomotor development - Physical growth - Safety (that is, gastrointestinal effects, infections such as malaria, mortality).	<u>Number of studies</u> 35 studies (49 articles), of which 13 included participants aged 12 to 60 months (although not exclusively). The rest were in children aged up to 12 months. Only findings from MAs where the % weighting from studies that included children aged 12 to 60 months was >50% were extracted into Annex 8. If this information was not available, the data were extracted (see Immune function). <u>Countries</u> Mainly MIC <u>Interventions</u> - Most trials provided iron as ferrous salts, with daily doses typically of 10 to 15 mg or 3 to 6mg per kg, either alone, or with other micronutrients (mainly zinc, folic acid or vitamins A, C or D). - Most interventions had a duration between 3 and 6 months.	<u>Results of the SR (in children aged 4 to 23 months)</u> Neurological development See Annex 8, Table A8.15 on mental development. Findings on psychomotor development were not extracted because <50% weighting in MA from studies in children aged 12 to 60 months Immune function See Annex 8, Table A8.16; to note that it was unclear from the SR or MA which studies contributed to the findings. Therefore, findings may relate to children < age 12 months. Iron status or haemotological parameters and growth outcomes Findings not extracted because <50% weighting in main MA were from studies in children aged 12 to 60 months Subgroup analyses for each outcome by dose, intervention duration, present breastfed status, and malaria endemicity not extracted. Posthoc analyses of iron intervention (alone or in combination with another nutrient) was also not extracted. <u>Effect of iron on other micronutrients</u>	<u>Risk of bias or quality</u> - RoB assessed using Cochrane - Sensitivity analysis performed with studies considered at low overall risk of bias - Funnel plots to assess potential publication bias <u>Confounding factors</u> The review authors did not comment on confounders. <u>Limitations</u> (from the authors) - The risk-benefit analysis on the effects of iron supplements on mental development in young children (needed for appropriate guideline development) is affected by the inability to definitively quantify cognitive benefits. - The conclusions on the effects of iron supplementation on growth in children who are anaemic or iron deficient are limited by the scarcity of data. <u>Limitations</u> (from the review team) The age group of interest for this SR was 4 to 23 months, without differentiating 4 to 12 months from 12 to 23 months. <u>AMSTAR overall confidence rating</u>: high

Study	Methods	Included studies	Results	Comments
	Meta-analysis - MA conducted for outcomes reported by at least 2 trials. - Random-effects model - For each outcome, subgroup analyses performed: baseline anaemia and iron status, dose and duration of supplementation, present breastfed status, and malaria endemicity. Posthoc analyses performed comparing iron vs control and iron in combination with another nutrient vs that nutrient alone. - Sensitivity analysis performed including only studies at low risk of bias. - Publication bias assessed with funnel plots for outcomes with more than 10 trials.		Findings not extracted because all studies included in MAs were in children aged <12 months at baseline.	

Study	Methods	Included studies	Results	Comments
Pratt (2015) 'A review of the strategies used to reduce the prevalence of iron deficiency and iron deficiency anaemia in infants aged 6–36 months' Study design Systematic review of RCTs and controlled observational studies Funding Not specified Declaration of interest The author is employed by Nestle Nutrition UK and Ireland	Research question To compare the effectiveness of several strategies used to reduce the prevalence of ID and IDA in infants aged 6 to 36 months. Search criteria *Search dates*: from 2004 to October 2014 *Study design*: RCTs, quasi-randomised trials and non-randomised controlled trials *Language*: not specified *Population*: children aged 6 to 36 months at enrolment, either healthy or diagnosed with ID or IDA. All included studies were required to have a minimum of 30 subjects in total. *Interventions* and *comparators*: types of interventions included any strategy or method used to reduce the prevalence of ID and IDA compared to control, or other current regiments to increase haemoglobin status and reduce the prevalence of ID and IDA Primary outcomes - Haemoglobin (g/l) - Anaemia (as defined by trialists) - Iron deficiency (ID) (as defined by trialists, based on biomarkers of iron status) - Iron status (as reported)	Number of studies 15 studies met the inclusion criteria, of which only 8 passed the quality assessment (see column 'comments'). Of the 8 studies, 5 included participants aged 12 to 60 months at baseline. 1 was included in the SR or MA by Matsuyama et al (2017). Number of participants Not specified. Sample size of 5 studies of interest ranged from 115 to 2283. Age of participants Of the 5 studies of interest, 3 studies had participants <12 months at baseline. Older children at baseline were 43 months (1 study). Older children at the end of interventions were aged 42 to 47 months (2 studies). Countries Mainly middle income countries Intervention doses - Typical supplementation dose	Main results for the age group covered in this report See Annex 8, Table A8.12 for detailed results of the following strategies to improve iron status in young children. - Micronutrient sprinkles (1 trial) - Iron-fortified milk (3 trials) - Efficacy of different strategies (1 trial)	Risk of bias or quality Trial quality assessed using a modified CASP tool (11 criteria – details not provided). Each study was assigned a score out of 11. To pass the quality assessment, studies had to score ≥10. Confounding factors The review author did not comment on confounders. Limitations (from the author) - Review conducted by only 1 researcher (did not follow full SR protocol). - In the quality assessment, points were deducted when participants were not blinded to the treatment. However, it remains almost impossible to conduct an intervention blind in nutrition science. Limitations (from the review team) - The search strategy stated that non-randomised controlled trials were included, but the PRISMA diagram stated that 3 studies were excluded because "assignment of patients to treatments not randomised" - IDA not listed as an outcome but in the research question - target group: 6 to 36 months, but in one place it says 3 to 36

Study	Methods	Included studies	Results	Comments
		was 12.5mg per day; typical dose in fortified milk was 5 to 6mg. - Average duration of the interventions was 6 months.		months, and in the abstract 6 to 12 months - Not enough detail provided regarding quality assessment, including which studies failed the quality assessment and on which basis - Barely any discussion on baseline data and how this could have contributed to study heterogeneity. AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Ramakrishnan et al (2009) 'Effects of micronutrients on growth of children under 5 years of age: meta-analyses of single and multiple nutrient interventions" Study design Systematic review with meta-analysis of RCTs Funding Supported by the micronutrient initiative, Ottawa, Canada. Declaration of interest None to declare.	Research question To identify well-designed RCTs conducted in children <5 years old with selected micronutrients, both single and combined interventions, and conduct MA to evaluate the effect of these interventions in improving child growth. Search criteria *Search dates:* up to April 2008 *Search design:* RCTs *Language:* English *Population*: children aged <5 years old *Intervention and comparators:* intervention provided to treatment and control children differed only in the inclusion of the micronutrients of interest (vitamin A, iron, zinc, or multiple micronutrients [MM]); studies with duration of follow-up <8 weeks, with lack of control groups or conducted on children with chronic diseases or conditions that affect growth were excluded. Primary outcomes - Annual change in height or height-for-age z-score - Annual change in weight or weight-for-age z-score - Annual change in weight-for-height z-score (WHZ) Statistical analyses	Number of studies Vitamin A: 17 studies Iron: 27 studies Zinc: 43 studies MM (≥3 micronutrients): 20 studies Number of participants Vitamin A: sample size ranging from 51 to 21,250. For the other interventions, sample sizes were smaller, with a maximum of 407 for iron, 1665 for zinc and 386 for MM. Countries Mainly LMIC Intervention Vitamin A: provided as a high dose supplement (60 mg) every 4 to 6 months in most studies; duration 12 to 104 weeks. Iron: delivered in the form of a tablet or syrup taken daily in most studies; most common dosage was 10 mg per day (higher doses of 20 to 60 mg per day used in some studies with children >15 months); duration 8 to 52 weeks.	Main results (as reported in the SR) Vitamin A supplementation (see Annex 8, Table A8.18 for details) Vitamin A and zinc (2 studies): - height (0.10; 95% CI -0.41 to 0.61) - weight (0.11; 95% CI -0.58 to 0.80) - WHZ (0.05; 95% CI -0.12 to 0.22). Iron supplementation: findings were not extracted because <50% estimates (13 of 34) included in MA were from studies that included children aged 12 to 60 months. Zinc supplementation: findings were not extracted because <50% estimates (23 of 56) included in MA were from studies that included children aged 12 to 60 months. Iron and zinc, iron and folic acid: findings were not extracted because all studies in MA were in children aged <12 months. MM ≥ 3 micronutrients: findings were not extracted because <50% estimates (7 of 27) included in MA were from studies that included children aged 12 to 60 months.	Risk of bias or quality - Study quality not assessed; publication bias was the only RoB taken into account by the review authors. - Absence of publication bias for most MAs, except for the effects of zinc on WHZ. Many studies that reported effects of zinc on height and weight change did not report on WHZ, which may explain some of the observed publication bias. Confounding factors - No discussion included on confounding factors, although the review authors did perform subgroup analyses, including baseline nutritional status and baseline Hb. Limitations (from the authors) - The limited variability in the dosage used and lack of data on baseline nutrient status, especially zinc, made it difficult to identify the conditions under which these interventions might be beneficial. - Dearth of well-designed trials that evaluate the benefits of micronutrients in the context of food-based approaches or examine the long-term effects of these interventions.

Study	Methods	Included studies	Results	Comments
	- Random-effects model - Sensitivity analysis performed using different assumptions for the correlation between pre- and post-test variance. - Heterogeneity: chi square test of significance. - Subgroup analyses: mean initial age of children, duration of intervention, baseline nutritional status, baseline haemoglobin and, for MM interventions, mode of administration and combination of micronutrients. - Publication bias evaluated by the funnel plot, Egger's and Begg's tests.	Zinc: mainly provided daily as a liquid supplement; dosage varied from 20mg per week to 20mg per day; duration 8 to 64 (median 24) weeks. MM: administrated as daily or weekly supplements (as foodlets, syrup or tablets) or fortified foods; 80% of the interventions contained vitamin A, iron and zinc. Some also contained iodine (2 studies), selenium (4 studies) and copper (2 studies); duration 8 to 64 weeks.		AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Thompson et al (2013) (Note that last author is Pasricha) ‘Effects of daily iron supplementation in 2- to 5-year-old children: Systematic review and meta-analysis’ Study design Systematic review with meta-analysis of RCTs and quasi-RCTs Funding Victoria fellowship (Government of Victoria), a CRB Blackburn Scholarship (Royal Australasian College of Physicians) and an Overseas Research Experience Scholarship (University of Melbourne) Declaration of interest 1 author received an unrestricted research grant as a co-investigator from Vifor Pharma Ltd and	Research question To summarize the evidence for effects of daily iron supplementation administered to children aged 2 to 5 years of age. Search criteria *Search dates*: up to March 2012. *Study design*: randomized and quasi-randomized controlled trials *Language*: no restrictions. *Population*: children aged 2 to 5 years, from all demographic and geographic settings; children with severe anaemia (Hb <70g/l) or suffering from a medical condition that substantially alters iron metabolism were excluded. *Interventions and comparators*: oral iron supplementation ≥5 days per week; oral iron supplement comprised iron salts and other compounds including carbonyl iron and colloidal iron; studies that included a co-intervention were included, provided that the co-intervention was also applied identically in the control arm. Primary outcomes - Hb concentration - Anaemia (defined by the authors) - Iron status (defined by iron indices) - Cognitive or school performance - Psychomotor performance - Physical growth - Safety	Number of studies 15 studies, all included participants aged 12 to 60 months at baseline. Number of participants Between 394 (cognitive development) and 1680 (Hb) participants contributed to the pooled estimates. Countries Mainly LMIC, only 2 trials conducted in HIC Interventions - Most of the studies provided iron as ferrous sulfate, with daily doses between 10 and 82.5mg, either alone, or with other micronutrients (such folic acid or vitamins A or C, or zinc). - Most interventions had a duration between 1 and 12 months.	Main results Haematological measures For the following outcomes, see Annex 8, Table A8.13 for detailed results of main MA and subgroup MAs by baseline status (iron replete, iron deficient, anaemic, mixed, unknown or unreported status) - Haemoglobin - Ferritin - Anaemia No trials reported on iron deficiency or iron deficiency anaemia Other haematologic parameters No effect on transferrin saturation (MD 6.70%; 95% CI 1.68 to 11.72; p=0.74; I^2=0%; 3 studies), hematocrit (MD 0.00; 95% CI -0.01 to 0.01; p=0.66; I^2=25%; 3 studies) or mean cell volume (MD 2.49fl; 95% CI -1.10 to 6.08; p=0.17; I^2=70%; 2 studies). Physical growth See Annex 8, Table A8.14 for detailed results for weight or change in weight or weight z-scores; height or change in height or height z-scores Cognitive development Authors noted that 2 of 4 studies that examined this outcome had data that could be extracted. Both	Risk of bias or quality - RoB assessed using the Cochrane tool, which addresses selection, performance, attrition, detection, and reporting bias. - Studies were considered at low risk of bias if they were at low risk of both selection and allocation bias and one of detection, performance, or reporting bias. - All included studies were considered at high risk of bias. Confounding factors - Baseline characteristics of treatment and control groups were similar in all but one study. Limitations (from the authors) - There was a lack of studies measuring outcomes of anaemia, iron deficiency or iron deficiency anaemia. - Studies did not discuss or account for the effect of inflammation or infection on ferritin. - There were few data evaluating the impact of iron supplementation on development. - Only 4 outcomes contained sufficient trials to enable subgroup analysis. - Techniques such as meta-regression could not be used

Study	Methods	Included studies	Results	Comments
has served as a consultant to the Meat and Livestock Authority Australia.	<u>Meta-analysis</u> - Random-effects model - Clinical heterogeneity assessed by determining similarity between subjects and outcomes of included studies. Statistical heterogeneity determined using I^2 tests. - Subgroup analysis performed on outcomes containing > 3 studies. Subgroups included sex; baseline Hb, iron status; breastfeeding status; daily iron dose; duration of supplementation; and malaria endemicity of the setting. - Publication bias (funnel plot) could not be assessed because no outcomes contained more than 10 studies.		studies were in participants with mixed or unknown baseline iron status. Findings from these 2 studies were therefore not extracted in Annex 8. Infection See Annex 8, Table A8.16 for detailed results	because of the paucity of the studies. <u>AMSTAR overall confidence rating</u>: moderate

Foods, dietary components, and dietary patterns

Table A5.3. Evidence table – foods and dietary patterns

Study	Methods	Included studies	Results	Comments
Costa et al (2018) 'Consumption of ultra-processed foods and body fat during childhood and adolescence: a systematic review' Study design Systematic review of observational and intervention studies Funding No specific grant support Declaration of interest None to declare	Research question To review the available literature on the association between consumption of ultra-processed foods and body fat during childhood and adolescence. Search criteria *Search dates:* up to 15 July 2016 *Study design:* human studies *Language:* no restrictions *Population:* healthy children and adolescents *Intervention or exposure and comparators:* consumption of ultra-processed food as defined by the NOVA food classification Primary outcomes Body fat	Number of studies 26 studies (5 trials, 15 PCS, 6 CS), of which 3 PCS had participants aged 12 to 60 months at baseline. Number of participants Of the 3 PCS of interest, n=292, 585 and 4750 Age of participants Participants were aged between 3 and under 5 years at baseline and followed up until age 8 years (1 study), 15 years (1 study) and 18 years (1 study) Countries HIC	Results of interest for the age group covered in this report Of the 3 studies, 2 reported that dietary patterns consisting of processed foods were associated with increased body fat in both sexes and 1 study found the same association only in boys (see Annex 8, Table A8.27 for details).	Risk of bias or quality - STROBE used to evaluate observational studies (maximum score 22); CONSORT used to evaluate intervention studies (maximum score 25) - Quality score of the 3 studies of interest were not reported. Confounding factors - The main variables used in the adjusted analyses were total energy intake, residual energy intake (energy intake from sources other than the foods evaluated), physical activity, age, sex, skin colour or ethnicity, parents' education and BMI, age at the menarche or at sexual maturation, birth weight and breast-feeding. Limitations (from the authors) - Studies that adjusted for total energy intake (including energy provided by ultra-processed foods) may have over-adjusted for the exposure, thus decreasing the magnitude of the association between consumption of ultra-processed foods and body

Study	Methods	Included studies	Results	Comments
				fat. Adjustment should therefore be limited to residual energy solely from other [food and beverage] sources. - Dietary patterns vary according to sex, SES, ethnicity and culture such that specific dietary patterns are derived for each specific population, which impairs the comparability of findings between studies. AMSTAR overall confidence rating: moderate

Study	Methods	Included studies	Results	Comments
de Beer (2012) 'Dairy products and physical stature: a systematic review and meta-analysis of controlled trials' Study design Systematic review and meta-analysis Funding Not specified Declarations of interest Not specified	Research question Do dairy products supplementation trials in children or adolescents consistently show extra linear growth compared to the growth effect of usual diet? Search criteria *Search dates:* cut-off date not specified *Study design:* randomised and non-randomised controlled trials *Language:* no restrictions *Population:* children and adolescents (age 2 to 18 years); very low birth weight infants, participants with a history of diseases that negatively influenced physical growth, and overweight or obese participants were excluded. *Intervention and comparators:* supplementation of usual diet with dairy products Primary outcome Linear growth Statistical analysis - Fixed and random effects - Heterogeneity (I^2 and Q statistic)	Number of studies 12 trials (7 RCTs and 6 non-RCTs), of which 1 RCT included children aged 12 to 60 months at baseline. Number of participants The RCT of interest included 402 participants Age of participants Participants had a mean age of 3.3 years at baseline and the study had a 9 month duration Countries UMIC	Results of interest for the age group covered in this report The 1 RCT found that children randomised to receive yoghurt (125g) for 5 days a week experienced a greater change in height (cm) than children in the control group (no intervention) (see Annex 8, Table A8.25 for details).	Risk of bias or quality - Study quality assessed using an adaptation of a checklist developed by Tulder et al (2003) and Steultjens et al (2004). - trial as higher quality. Higher quality trials are trials with a quality score of at least 67%, 50% and 50% for internal validity, external validity and statistical handling, respectively. - The study of interest scored 50%, 75% and 100% for internal validity, external validity and statistical handling, respectively. It was unclear whether treatment allocation was concealed and its drop-out rate was considered unacceptable (≥20%) - No evidence of publication bias Confounding factors - Review mentions that in order to test the hypothesis that dairy products have a special effect on growth above and beyond its contribution to energy intake, controlling for energy intake in trials is necessary. The study of interest did not control for energy intake.

Study	Methods	Included studies	Results	Comments
	- Publication bias assessed with a funnel plot - Potential effect modifiers and sources of heterogeneity investigated by meta-regression: type of dairy product, age, baseline height and usual consumption of dairy products and nutritional status			- None of the included studies controlled for energy expenditure (physical activity). AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Delgado and Matijasevich (2013) 'Breastfeeding up to two years of age or beyond and its influence on child growth and development: a systematic review' <u>Study design</u> Systematic review of observational studies <u>Funding</u> Not specified <u>Declaration of interest</u> Not specified	<u>Research question</u> (1) to describe the global prevalence of breastfeeding up to two years of age or beyond and the global trends in prevalence rates over the past three decades; and (2) to conduct a systematic literature review on the medium-term effects of breastfeeding up to two years of age or beyond on two crucial aspects of child health: growth and development. <u>Search criteria</u> *Search dates:* cut-off date not specified *Study design:* not specified *Language:* no restrictions *Population:* <18 years old *Exposure and comparators:* breastfeeding up to 2 years and beyond <u>Primary outcomes</u> - Child growth - Child development	<u>Number of studies</u> 8 studies (4 PCS, 4 CS), of which 8 had participants aged 12 to 60 months at baseline (4 PCS, 4 CS). <u>Number of participants</u> Of the 4 PCS of interest, 1 had 2752 participants, 1 had 1979, 1 had 443 and 1 had 28,753. <u>Age of participants</u> All 4 PCS of interest included children breastfed to 24 months or beyond and followed up for between 6 months and 6.5 years. <u>Countries</u> LMIC and LIC	<u>Results of interest for the age group covered in this report</u> Child growth (2 studies) Of the 2 studies, 1 found that children breastfed ≥2 years gained less weight between than those who were on solid foods only and 1 found that children breastfed ≥2 years had higher growth than children who had stopped breastfeeding Child development (2 studies) Of the 2 studies, neither found an association between continued breastfeeding and cognitive or psychosocial development (see Annex 8, Table A8.26 for details).	<u>Risk of bias or quality</u> - Study quality assessed using a modified Downs and Black scale which analyses 19 characteristics (including reporting, validity, bias, confounding and power of the study), with a maximum possible score of 20 points. - Of the 4 studies of interest, 1 scored 16, 1 scored 13, 1 scored 15 and 1 scored 17. <u>Confounding factors</u> - Confounding factors for some individual studies given, including socioeconomic status, child's age, previous diseases, maternal and paternal educational level, previous pregnancies, and availability of water, type of dwelling place and sewage services. <u>Limitations</u> (from the authors) - The lack of studies evaluating the effects of breastfeeding up to two years of age or beyond on child growth and development limits any firm conclusions regarding these effects <u>Limitations</u> (from the review team) - All the studies of interest were conducted in LMIC; the

Study	Methods	Included studies	Results	Comments
				generalisability of findings to UK-based populations is unclear. AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Dougkas et al (2019) 'A critical review of the role of milk and other dairy products in the development of obesity in children and adolescents' Study design Narrative review Funding The Dairy Council Declarations of interest None to declare	Research question To review intakes of milk and other dairy products, and obesity and indicators of adiposity, in children. Search criteria *Search dates:* January 1990 to June 2017 *Study design:* cross-sectional, prospective longitudinal studies and intervention studies *Language:* English *Population:* healthy children age 1 to 18 years at baseline. *Intervention or exposure and comparators:* milk and any dairy product (calcium-containing foods including milk, cheese, yoghurt) Primary outcomes - Obesity - Indicators of adiposity (BMI, BMI standard deviation score, BMI z-score, % body fat, waist circumference, body weight status)	Number of studies 94 studies (31 PCS, 20 RCT, 43 CS) of which 14 PCS and 1 RCT included children aged 12 to 60 months at baseline. Number of participants Of the 15 studies of interest, sample sizes ranged from 49 to 14,224. Four studies included <100 participants; 4 studies included >100 to <500; 2 studies included >500 to <1000; 2 studies included >1000 to <5000; 3 studies included >5000 Age of participants Of the 15 studies of interest, all included children aged 1 to 5 years at baseline (with one study including children up to age 6 years). Follow-up duration ranged from 8 months to 12 years. Countries HIC	Results of interest for the age group covered in this report Milk intake and later BMI or adiposity (4 studies) Of the 4 studies, 3 found no association and 1 found an inverse association. Low fat vs full-fat dairy product intake and later BMI or adiposity (2 studies) Results from the 2 studies were inconsistent. Other dairy foods and later BMI or adiposity (1 study) found direct association between lower cream or crème fraiche intake and overweight or obesity Total dairy intake and later BMI or adiposity (4 publications reporting on 2 PCS) Of the 4 studies, 3 that reported adjusted analyses reported an inverse association. Nutrients consumed from dairy products and later BMI or adiposity (2 studies) One of the 2 studies found that higher total dairy protein intake per day was associated with an increase in weight The second study found that greater increases in energy consumed from milk were inversely associated with	Risk of bias or quality Study quality was not assessed. Confounding factors Review authors noted whether results were adjusted and for which confounding factors. They list important confounding factors to include energy intake, diet quality, physical activity, baseline BMI, sex, ethnicity and SES. Limitations (from the review authors) - High variation on the definition and inclusion of dairy foods and type of milks, and definition and reporting of dairy food serving sizes - Variation in reporting of outcome variables related to weight status and adiposity measures - Lack of regular assessment of dairy product and dietary intake throughout childhood and adolescence in the included studies. The patterns regarding the type of milk and other dairy product consumption might not be stable over time especially given the introduction and greater availability of reduced-fat

Study	Methods	Included studies	Results	Comments
			changes in children's waist circumference. (See Annex 8, Tables A8.1, A8.8 and A8.25 for details)	dairy products over the last 25 years - Adjustment for important confounding factors were inconsistent and varied among the studies, making it difficult to interpret and compare the results across study cohorts - One-third of the 31 PCS included in the review were funded by the dairy or private industry; 5 of 10 industry- or privately-funded studies showed favourable results for dairy foods compared with 4 of 21 publicly-funded studies <u>AMSTAR overall confidence rating:</u> low

Study	Methods	Included studies	Results	Comments
Dror and Allen (2014) 'Dairy product intake in children and adolescents in developed countries: trends, nutritional contribution, and a review of association with health outcomes' Study design Systematic review of observational and intervention studies Funding International Dairy Federation Declarations of interest None to declare	Research question To evaluate milk and dairy product intake among children and adolescents in developed countries and to consider how dairy product consumption is related to key nutrient intake and health outcomes. Search criteria *Search dates:* to September 2012 *Study design:* cross sectional, cohort, case-control and intervention trials (controlled and not controlled) *Language: English* *Population:* healthy children aged 2-19 at baseline *Intervention or exposure and comparators:* dietary milk or dairy intake Primary outcomes - Adiposity - Bone mineralization (studies reporting only bone mineral density rather than bone mineral content were excluded on the basis of dynamic bone turnover in children) - Dental health - Linear growth - Blood pressure	Number of studies 78 studies, of which 9 PCS included children aged 12 to 60 months at baseline. Of the 9, 1 of these studies (Rangan et al 2012) reported on 3 outcomes (BMI or body fat or energy balance, linear growth and blood pressure). Number of participants Of the 9 studies of interest, sample sizes ranged from 53 to 1,345. Three studies included <100 participants; 4 studies included >100 to <500; 1 study included >500 to <1000; 1 study included >1000 to <5000. Age of participants Of the 9 studies of interest, all included children aged 1 to 5 years at baseline (with two study including children up to age 6 years). Follow-up duration ranged from 8 months to 16 years. Countries Studies of interest were all conducted in HIC	Results of interest for the age group covered in this report BMI, body fat or energy balance (5 studies) All 5 PCS (Rangan et al 2012, Moore et al 2006, Huh et al 2010, Newby et al 2004, Carruth and Skinner 2001) were included in the review by Dougkas et al 2019. See Annex 8, Table A8.25 for details of these studies. Bone health (1 study) - 1 PCS found that ≥2 servings per day of dairy through childhood was associated with bone health Linear growth (1 study) - 1 PCS found no association between height and dairy consumption (See Annex 8, Table A8.25 for details) Blood pressure (2 studies) Both studies found an inverse association between dairy intake in early childhood and lower blood pressure in middle childhood to early adolescence. (See Annex 8, Table A8.25 for details) Dental health (1 study) - 1 PCS found that median milk intakes at age 2 and 3 years was lower in children with caries (See Annex 8, Table A8.41 for details).	Risk of bias or quality Study quality was not assessed. Confounding factors Authors identified key confounding factors for the outcome BMI or body fat or energy balance as total energy intake, physical activity, pubertal status, baseline BMI; otherwise whether individual studies adjusted for confounding was not assessed (details of these were retrieved by reading the primary studies) Limitations (from the authors) - Few studies have measured biomarkers of nutrient status associated with dairy consumption in children - Aspects of the metabolic syndrome, which have been inversely associated with dairy intake in animal models and adults, warrant research in children and adolescents AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Karalexi et al (2018) 'Non-Nutritive Sweeteners and Metabolic health Outcomes in Children: A Systematic Review and Meta-Analysis' Study design Systematic review with meta-analysis Funding Not stated. The authors are from the Third Department of Pediatrics, National and Kapodistrian University of Athens, General University Hospital "Attikon", Athens, Greece Declaration of interest None to declare	Research question to systematically identify, critically appraise, and quantitatively synthesize current evidence regarding the potential association of non-nutritive sweeteners (NNS) consumption during childhood and adolescence with negative metabolic outcomes, including obesity and diabetes. Search criteria *Search dates* up to 12 February 2017 *Study design:* cohort and case control studies *Language:* Not restricted *Population*: Children under 18 years of age *Exposure and comparators:* consumption of non-nutritive sweeteners (assessed by validated food frequency questionnaires with record period varying from 24h to 30 days) Primary outcomes Risk of obesity and diabetes Statistical analyses Metanalyses only conducted in older children - Random-effects model	Number of studies 13 PCS of which 3 had participants aged 12 to 60 months at baseline. Number of participants The 3 PCS of interest included n=177, 1345, 2547 participants Age of participants Participants were aged 2 to 4.5 years at baseline and followed up for 6 months to 10 years Countries HIC	Results of interest for the age group covered in this report Change in BMI or BMI z-score (2 studies) Both studies found no association Diabetes (Type 1) (1 study) 1 PCS in children at increased risk of developing type 1 diabetes (T1D) found no association (See Annex 8, Table A8.30 for details for both outcomes) Review's conclusion Comprehensive assessment of existing literature provides inconclusive evidence regarding the impact of NNS intake in childhood on metabolic health.	Risk of bias or quality - Newcastle-Ottawa Scale used to score the quality of the studies - Factors that mainly compromised study quality were the unadjusted effect estimates and incompleteness of follow-up >80% of completeness - No evidence for publication bias (p=0.9) for the studies included in metanalysis Confounding factors Confounding factors not specified. Limitations (from the authors) - Data availability of the eligible studies, heterogeneity of methodological approaches in primary studies, NNS represent a rather heterogeneous class of items, self-reported data on the consumption of NNS, nonresponse from contacted authors AMSTAR 2 overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
	- Heterogeneity (Q test and I^2 statistic) - Subgroup analysis by sex - Sensitivity analyses retaining only the high-quality studies was performed (missing <2 points in the Newcastle-Ottawa Scale) and studies presenting adjusted effect estimates - Publication bias (Egger's test and funnel plots)			

Study	Methods	Included studies	Results	Comments
Ledoux et al (2011) 'Relationship of fruit and vegetable intake with adiposity: a systematic review' <u>Study design</u> Systematic review <u>Funding</u> Robert Wood Johnson Foundation and federal fund from the USDA Agricultural Research Service children's Nutrition Research Centre <u>Declaration of interest</u> None to declare	<u>Research question</u> To assess the fruit and vegetable consumption to adiposity relationship <u>Search criteria</u> *Search dates:* 1980 to January 2009 *Study design:* longitudinal or experimental designs *Language:* English *Population*: healthy children, adolescents or adults *Intervention or exposure and comparators:* Intake of whole fruit and vegetables <u>Primary outcomes</u> - Obesity and weight	<u>Number of studies</u> 23 studies (12 experimental, 11 PCS), of which 2 PCS had participants aged 12 to 60 months at baseline <u>Number of participants</u> Of the 2 PCS of interest, n=971 and 1379 <u>Age of participants</u> Participants were aged 1 to 5 years at baseline and followed up for 6 months to 2 years <u>Countries</u> HIC <u>Exposures</u> Fruit and vegetables and intake was measured using an FFQ	<u>Results of interest for the age group covered in this report</u> Association between vegetables and fruit consumption and adiposity (2 studies) Of the 2 PCS of interest, 1 reported no association between vegetables and fruit consumption and adiposity and one found an association between greater vegetable consumption and adiposity. (See Annex 8, Table A8.24 for details) <u>Review's conclusion</u> The relationship of vegetables and fruit intake and adiposity among children remains unclear.	<u>Risk of bias or quality</u> - Research findings and their validity were compared by critiquing research methods. Research factors determined to enhance study validity included: rigor of study design, validity of measures, statistical adjustment of potential confounding variables (including dietary reporting bias), and sufficient sample size to detect hypothesized relationships. - The review included a rationale for assessing validity by specific indicators of research methods mentioned above but did not report on the outcomes of this assessment. -Studies were also assessed on how foods were classified as fruit or vegetable, whether adjustments were made for over- or under-reporting of dietary intake, how outcomes were measured (including by self-report or by trained personnel) - The 2 studies of interest did not control for energy expenditure and had only 3 years or less of follow up. <u>Confounding factors</u> - Authors indicated that to enhance validity, studies should control either statistically or by design for:

Study	Methods	Included studies	Results	Comments
				energy expenditure, energy intake, socioeconomic status, ethnicity, age, gender and social desirability of response (in the case of experimental studies). Limitations (from the review team) - both studies of interest did not assess physical activity - The review did not use a standardised tool for RoB assessment - Neither study of interest adjusted for other dietary and health behaviours that might influence child weight status such as dietary intake of high fat, sugar salt foods. AMSTAR 2 overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Onubi et al (2015) 'Effects of probiotics on child growth: a systematic review' Study design Systematic review Funding Not specified Declaration of interest None to declare	Research question To add to the evidence of the effects of probiotics on child growth irrespective of age, type of probiotic bacteria or nutritional status of the children Search criteria *Search dates:* 1947 to October 2012 *Study design:* all study designs *Language:* no restrictions *Population*: well-nourished and under-nourished children; studies that looked at probiotic use for the management of a disease condition other than under-nutrition, and studies in children with impaired growth at birth were excluded. *Intervention and comparators:* probiotic product use (probiotic use for the management of a disease was excluded) Primary outcomes - Change in weight, length or height, head circumference, BMI, mortality rate	Number of studies 12 studies (10 RCTs, 2 non-randomised clinical controlled trials), of which 2 RCTs were in well-nourished children aged 12 to 60 months and 4 studies were in under-nourished children aged 12 to 60 months. For the purposes of this RA, only results from the 2 studies in well-nourished children have been extracted. Countries HIC and UMIC (studies of interest) Intervention The intervention in both studies of interest were multiple probiotics	Results of interest for the age group covered in this report Weight or height gain (2 studies) One of the 2 studies found an effect and the second study found no effect (see Annex 8, Table A8.29 for details) Review's conclusion No evidence was found for a benefit of dietary intake of probiotics on growth in well-nourished children in developed countries. Some benefit was shown in terms of weight gain in the one study in well-nourished children in a developing country	Risk of bias or quality - Study quality assessed using a modified Cochrane review quality assessment form. - Both studies of interest had unclear risk of bias for allocation concealment Confounding factors Not applicable. Setting (developing vs developed), nourishment of the child (well-nourished vs undernourished), eating practices and sanitation may be effect modifiers. Limitations (from the authors) - More research needed on the specific probiotic strains that improve growth in children in developing countries Limitations (from the review team) - Paucity of studies in well-nourished children in developed (and developing) countries makes it difficult to draw conclusions. AMSTAR overall confidence rating: low

Study	Methods	Included studies	Results	Comments
Tandon et al (2016) 'The relationship between physical activity and diet and young children's cognitive development: A systematic review' <u>Study design</u> Systematic review <u>Funding</u> Supported by the Robert Wood Johnson Foundation's Healthy Eating Research Program <u>Declaration of interest</u> Not specified	<u>Research question</u> To systematically review the literature on the relationship between physical activity and dietary patterns and cognitive development in early childhood. *To note that the search and results are separated into 2 parts, here we only report on dietary patterns.* <u>Search criteria</u> *Search dates:* 2005 up to February 2016 *Study design:* all designs (except case studies) *Population:* children aged 6 months to 5 years at initial assessment *Language:* English *Intervention/exposure and comparators:* quantitative method of assessing total diet (for example,, diet diary, 24-hour recall, food frequency questionnaire), dietary pattern, diet index score, meal composition or other indicator of overall diet quality; studies focusing solely on the effect of breastfeeding or breast milk were excluded. <u>Primary outcomes</u> - Cognitive development	<u>Number of studies</u> 8 publications included on diet, of which 6 (reporting on secondary analyses from 3 PCS) assessed exposure in children aged 12 to 60 months. To note that 4 of the 6 studies of interest analysed data from the same PCS (Avon Longitudinal Study of Parents and Children). <u>Number of participants</u> The number of participants in the studies of interest ranged from 1366 to 7652. <u>Age of participants</u> See results column. <u>Countries</u> HIC, including the UK	<u>Results of interest for the age group covered in this report</u> Cognitive development (6 publications reporting on secondary analyses from 3 PCS) All 6 publications found an association between some dietary patterns and measures of cognitive development (See Annex 8, Table A8.3, A8.25, A8.27 and A8.28 for details) <u>Authors' conclusion:</u> Our review found preliminary evidence suggesting a direct association between healthy dietary patterns (defined as diets high in fruits, vegetables, whole grains) before the age of 5 and later childhood cognitive outcomes. Although the findings provide some indication of direct associations, the limitations of the work point towards the need for additional investigations in this area.	<u>Risk of bias or quality</u> - No formal assessment of quality of selected studies but authors broadly addressed study strengths and weaknesses - Only studies with quantitative assessment of diet were included <u>Confounding factors</u> - Review authors did not identify potential confounding variables of interest and did not state which variables the primary studies adjusted for (information on confounders from primary studies), acknowledged possible of residual confounding <u>Limitations</u> (from the authors) - Each study created its own, slightly varied, definition of 'healthy' and 'unhealthy' dietary patterns. 'Healthy' usually aligned with recommendations in which fruits, vegetables and whole grains were important while 'unhealthy' usually included energy dense foods with high sugar and fat content. - Several of the studies were from the same ALSPAC cohort and had limited data on different ethnic minority groups and incomplete data

Study	Methods	Included studies	Results	Comments
				from some groups which may limit generalisability. - In many studies (including some studies of interest), there was a significant gap in the ages at which diet and cognition were assessed leading to increased likelihood that other factors may have influenced the cognitive outcomes observed. AMSTAR overall confidence rating: critically low

Eating and feeding behaviours

Table A5.4. Evidence table – eating and feeding behaviour

Study	Methods	Included studies	Results	Comments
Appleton et al (2018) ‘Sweet taste exposure and the subsequent acceptance and preference for sweet taste in the diet: systematic review of the published literature’ Study design Systematic review of controlled trials and population cohort studies. Funding Unilever RandD Declaration of interests 3 authors had no DOI	Research question Does dietary exposure to sweetness in humans impact on the generalised acceptance, preference, choice, and/or intake of sweet taste in the diet? Search criteria *Search dates*: until 15 August 2017 *Study design:* all studies testing relations of variation in exposure to sweetness and subsequent variation in acceptance, preference or choice of sweetened foods or beverages in humans aged >6 months. CS studies excluded. *Language:* English *Population:* children aged >6 months *Interventions or exposures*: exposure to or a manipulation of sweet taste through foods and beverages in the diet (for example, sugar-rich foods, low energy sweetener-sweetened foods or beverages, fruit). Studies required to include repeat (>1)	Number of studies 14 controlled trials (of which 2 were in children <6 years); 7 PCS (of which 2 were in children aged 12 to 60 months at baseline) Number of participants Of the 4 studies of interest, n=39 and 53 (controlled trials); n=493 and 1163 (PCS) Age of participants Age range 12 to 84 months (controlled trials) and 1 to 7 years (PCS) Countries HIC	Results of interest for the age group covered in this report Controlled trials (2 studies): Both studies of interest manipulated exposure to sweet foods in the shorter-term (see Annex 8, Table A8.33 for detailed results) PCS (2 studies): Both PCS reported an association between exposure to juice or SSBs or confectionary and higher intakes in later years (See Annex 8, Table A8.33 for details)	Risk of bias or quality RoB was rated using 4 domains: adequate study power; discrepancy between number of participants that enter the study (ITT population) and number included in analysis (ITT analysis); number of drop outs; incomplete outcome reporting. Confounding factors No details provided. Author conclusions The available evidence does not provide clear, consistent support for a relationship between sweet taste exposures and the outcomes considered. Shorter term interventions suggested possible reduced preferences for sweet taste following greater exposure to sweetened stimuli, but findings from cohort studies and longer-term intervention trials were limited and equivocal. AMSTAR overall confidence rating: moderate

Study	Methods	Included studies	Results	Comments
2 authors were employees of Unilever	taste exposure and a comparator group. <u>Primary outcome</u> - Validated measure of perception (intensity), generalised acceptance, preference, choice and or intake of all or other sweet foods and beverages in humans aged >6 months.			

Study	Methods	Included studies	Results	Comments
Bergmeier et al (2015) 'Systematic research review of observational approaches used to evaluate mother-child mealtime interactions during preschool years' Study design Systematic review Funding None to declare Declarations of interest None to declare	Research question What do findings reveal about the associations between observed mother-child mealtime interactions and preschoolers' eating and weight status? Search criteria *Search dates:* Jan 1925 to March 2014 *Study design:* studies in which mother-child mealtime behaviours were measured through observation *Population:* healthy children aged 2-6 years *Language:* English *Exposure and comparators:* observational measures of children's eating or mealtimes with mothers present (observed or self-reported) Primary outcomes - Children's eating behaviours or cognition - Maternal feeding practices or behaviours - Child weight status	Number of studies 13 studies (12 CS, 1 PCS). The PCS included participants aged 12 to 60 months at baseline. Number of participants The PCS of interest included 1218 participants Age of participants Participants were aged 15 months at baseline and followed up until age 36 months Countries HIC	Results of interest for the age group covered in this report Maternal feeding behaviours and child weight status (1 PCS) - The PCS reported that maternal assertive prompting and intrusive style had a small but significant association with greater child adiposity (BMI z scores) at 36 months of age. See Annex 8, Table A8.35 for details. - Review's conclusion about this study: the study highlighted that the type of prompt (for example, assertive prompt) rather than simply the total number of prompts was associated with greater child adiposity. Children's eating behaviours or cognition or maternal feeding practices or behaviours No studies in children aged 12 to 60 months were identified	Risk of bias or quality No formal quality assessment Confounding factors No confounding factors identified by review authors. For the PCS of interest, it is unclear whether results were adjusted for confounding such as baseline child and maternal weight status. Limitations (from the authors) - None of the studies (including the PCS of interest) identified for the review evaluated how mutual dimensions (for example, parent responsiveness to the child and child responsiveness to the parent) of dyadic interactions between mothers and children influence maternal feeding practices, children's eating and weight. AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Blondin et al (2016) 'Breakfast consumption and adiposity among children and adolescents: an updated review of the literature' Study design Systematic review (update of a 2010 US National Evidence Library review) Funding None reported Declarations of interest None to declare	Research question What is the relationship between breakfast and adiposity in children? Search criteria *Search dates:* January 2010 up to January 2015. *Study design:* RCT or clinical controlled studies, cohort, case-control studies *Population:* human subjects <18 years old at baseline *Language:* English *Intervention or exposure and comparators:* studies with a measure of breakfast Primary outcomes Adiposity measures	Number of studies 12 studies (10 PCS, 1 intervention, 1 case-control) of which 1 PCS had participants aged 12 to 60 months at baseline. Number of participants The PCS of interest included 1366 participants Age of participants Participants were aged 2 years at baseline and followed up for 3 years Countries HIC	Results of interest for the age group covered in this report The PCS of interest reported no association between skipping or eating breakfast and child weight status (see Annex 8, Table A8.31 for details).	Risk of bias or quality Review did not report whether or how studies were quality assessed. Confounding - All studies controlled for at least one confounding variable; and most included several sociodemographic variables including ethnicity, age, parent education, sex and socioeconomic status. AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Brown et al (2016) ‘Association of Picky Eating and Food Neophobia with Weight: A Systematic Review’ Study design Systematic review of longitudinal, cross-sectional, and case-control studies. Funding Supported, in part, by a grant from NICHD and NIH Mentored Patient-Orientated Research Career Development Award K23 HD061597 (Skelton) and from the Health Resources and Service	Research question To determine whether the presence of PE or FN behaviours during childhood are associated with childhood weight status or with becoming underweight, overweight, or obese later in childhood and adolescence. Definition of ‘picky eating’ used: eating a limited variety of foods, but also covering fussy eating, food fussiness, and selective eating. Search criteria *Search dates*: from 1 January 1990 to 2 November 2015 *Study design:* No restrictions *Language:* English *Population:* children aged ≤18 years *Exposures:* PE or FN. Presence of PE determined through: - directly asking parents if their children were picky eaters - questionnaires: the 2 most common were the Child Eating Behaviour Questionnaire (CEBQ) and the Child Feeding Questionnaire (CFQ) - referral to a speciality feeding clinic for PE behaviours	Number of studies 41 studies, of which 21 included children ≤6 years. Of the 21 studies, 4 were PCS (and the rest were CS). Number of participants Of the 4 PCS of interest, 2 studies included >100 participants, 2 included >400 participants and 1 included nearly 1500 participants. Age of participants Studies of interest included children aged 12 months to 4.5 years at baseline and followed up for 1 to 2 years. Countries HIC	Results of interest for the age group covered in this report PE and weight status (4 PCS) - 2 of 4 PCS reported no association between PE and BMI or change in BMI; 1 reported a direct association between PE and change in BMI in girls only; 1 reported an association between PE and later odds of being underweight (see Annex 8, Table A8.31).	Risk of bias or quality RoB and confounding assessed using the Agency for Healthcare Research and Quality’s RTI Item Bank. Confounding factors Potential confounders (for example, demographics, family income, parental education) adjusted for in most studies, but other confounders (for example, parental weight status, feeding styles, community characteristics) often not adjusted for. Limitations (from the authors) Studies used inconsistent definitions of PE which limited the ability to combine the weight status data for meta-analysis. AMSTAR overall confidence rating: moderate

Study	Methods	Included studies	Results	Comments
Administration National Research Award (NRSA) grant T32 HP14001 (Brown, Vander Schaaf). Declaration of interests None to declare.	All studies that examined food neophobia (n=7) used the Child Food Neophobia Scale (CFNS) Primary outcomes Parental report of height and weight (categorical weight categories, weight z scores, weight SD scores, weight-for-age percentiles, BMIz, BMIz categorical) Measured height and weight (weight and height as continuous variables, BMI, BMI categorical, BMIz, percent ideal body weight, weight-for-length, weight-for-height)			

Study	Methods	Included studies	Results	Comments
Caleza et al (2016) Childhood Obesity and Delayed Gratification Behavior: A Systematic Review of Experimental Studies' Study design Systematic review of cohort and case-control studies Funding Not reported. Declaration of interests None to declare.	Research question To evaluate the extent of the association between instant gratification behaviour and childhood obesity. Search criteria *Search dates*: up to October 2014. *Study design:* controlled clinical trials, experimental, or cohort controlled studies, with a sample size of ≥100. *Language:* Not reported. *Population:* Any human study or clinical research that included a sample of at least 100 children. *Intervention:* performance of a delayed gratification test involving a choice between a reward (food or non-food) granted immediately and a larger one later. *Comparison:* studies that compared the responses to the delayed gratification test in different populations of children. Primary outcomes - Definition of delayed gratification behaviour: a social ability that involves being able to resist the temptation to take a smaller but more immediate reward and to	Number of studies 9 studies (3 CC, 6 PCS), of which 2 PCS in children aged 12 to 60 months assessed the ability to delay gratification or self-regulate when offered a food reward Number of participants The 2 PCS of interest included 805 and 1061 participants Age of participants Children aged 3 to 4 years at baseline, followed up until adolescence (age 11 to 13 years) Countries HIC	Results of interest for the age group covered in this report Both PCS reported an association between an inability to defer gratification and being overweight or obese in later childhood (see Annex 8, Table A8.31 for details).	Risk of bias or quality Assessed using the methodological index for non-randomised studies. Confounding factors Authors identified a number of confounding factors that might influence children's ability to delay gratification or regulate intake and impact on weight gain in childhood. These included: parenting style (permissive vs authoritarian); parental weight status; negative life events; family environment (for example, difficult and chaotic home environment). The authors did not consider whether the studies had adjusted for these. AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
	wait for a larger, more permanent reward later. - Children’s self-regulatory ability to defer gratification measured by time to wait for the later larger reward (ranged from 2 minutes to next day). - Measure of obesity: BMI (≥25 = overweight; ≥30); skinfold thickness – measured at follow up			

Study	Methods	Included studies	Results	Comments
Hodder et al (2018) 'Interventions for increasing fruit and vegetable consumption in children aged five years and under' Study design Systematic review with meta-analyses (a living systematic review) Funding Salary support from a variety of organisations including the Hunter Medical Research Institute, Australia; The University of Newcastle, Australia; Deakin University: Hunter New	Research question To assess the effectiveness, cost effectiveness and unintended adverse events of interventions designed to increase the consumption of fruit or vegetables or both among children aged five years and under Search criteria *Search dates:* until January 2018 for this review (as a living SR, monthly searches of select databases are conducted) *Study design:* RCTs including cluster-RCTs (C-RCTs), and crossover trials *Language:* no restrictions *Population*: children aged 5 years and under (trials including children older than 5 years were included only if the mean age of the study sample at baseline was five years or under); parents, guardians and families responsible for the care of children aged 5 years and under; professionals responsible for the care of children aged five years and under, including childcare staff and health *Intervention:* educational, experiential, health promotion or psychological or family or	Number of studies 63 studies (32 RCTs, 21 C-RCTs, 10 crossover trials) of which 40 studies included participants aged 12 to 60 months at baseline. 13 trials were included in a MA on the effect of child-feeding practice interventions compared with no treatment. Number of participants Of the 40 trials of interest, nearly 40 percent of these included <100 participants, and nearly 35 percent included 100-300 participants. The largest trials included >1,000 participants. Countries Mostly HIC (1 trial in the UK) Intervention - Child-feeding practices included:	Results of interest for this risk assessment (see Annex 8, Table A8.32 for more detailed findings). Effect of child-feeding practice interventions vs no treatment Short-term impact (less than 12 months) (13 trials, of which 10 involved children aged 12 to 60 months at baseline) - an overall small direct effect on vegetable consumption (SMD 0.33; 95% CI 0.13 to 0.54; p=0.0014; I^2=70%; 1,741 participants in 13 studies, of which 9 were in children aged 12 to 60 months) equivalent to an increase of 3.50g as-desired consumption of vegetables (very low-quality evidence) - Results were similar in sensitivity analyses of studies at low RoB, of studies with a primary outcome of child fruit or vegetable consumption, and of studies with low attrition or high attrition with ITT analysis. Long-term impact (12 months or longer) findings are from 2 trials in children aged <12 months and therefore were not extracted.	Risk of bias or quality - Study quality assessed using the Cochrane Collaboration tool - GRADE approach used to assess the quality of the evidence for the primary outcome of fruit and vegetable intake Limitations (from the authors) - Trials where fruit and vegetable intake was not considered to be a primary trial outcome to avoid any potential confounding effects of other behavioural interventions (such as physical activity) may lead to overestimates of intervention effects if in practice they are delivered in the context of other health initiatives. - A high probability of publication bias related to the relatively few trials included in the meta-analysis and inspection of funnel plots - Studies that were conducted predominantly in disadvantaged populations were included within the overall synthesis; effects of the interventions tested may differ between disadvantaged and general populations which may limit the generalisability of the review findings. - The effect size for both child-feeding and multicomponent interventions was small, which may limit the potential public health benefits of implementing these types of interventions. Limitations (from the review team)

Study	Methods	Included studies	Results	Comments
England Area Health Service, Australia; Cancer Council NSW, Australia; Cancer Institute NSW, Australia <u>Declarations of interest</u> Two of the authors declared that they were authors on a RCT included in the review but were not involved in the determination of study eligibility, data extraction or risk of bias assessment for the review	behavioural therapy or counselling or management or structural or policy or legislative reform interventions designed to increase consumption of fruit or vegetables or both in children aged 5 years and under. Interventions could be conducted in any setting including the home, childcare or preschool services, health services, or community settings. *Comparison*: any alternative intervention to encourage fruit and vegetable consumption, or a no-intervention control, usual care, or attention control or wait-list control. <u>Primary outcomes</u> Children's fruit and vegetable intake (grams or portions or servings per day or biomedical markers of vegetable and fruit consumption). - Outcomes of fruit or vegetable juice intake alone were not eligible. Outcomes that included child fruit and vegetable juice intake as part of an aggregate measure of child fruit or vegetable intake were eligible. <u>Statistical analyses</u> - random-effects model where there was unexplained heterogeneity in the primary	• the effect of repeated exposure • the effect of flavour nutrient learning • the effect of parent-feeding interventions • the effect of pairing vegetables and fruit with direct stimuli • the effect of pairing target vegetables with liked foods • the effect of varying serving sizes and different serving methods - Parent nutrition education (outside scope of this report) - Multicomponent interventions - Child nutrition education interventions		- Meta-analysis of varied child-feeding interventions (vs no intervention) meant that the effect of individual types of interventions could not be disaggregated <u>AMSTAR overall confidence rating:</u> high

Study	Methods	Included studies	Results	Comments
	analysis; fixed-effects model where there was no or low statistical heterogeneity in the primary analysis - Heterogeneity (I^2 statistic and visual inspection of forest plots of the included trials) - Subgroup analyses by sex of participants; interventions targeting minority groups; interventions delivered in various settings, interventions of varying intensities; interventions delivered in different modes • Subgroup analyses of interventions delivered in various settings and delivered in different modes were conducted where possible; for the rest of the planned subgroups, these were described narratively due to the lack of studies - Sensitivity analyses conducted to exclude studies at high risk of bias, studies not reporting an ITT analysis if they had high rates of participant attrition defined as >20%, studies that did not have a primary outcome of child fruit or vegetable consumption. - Publication bias (funnel plots)			

Study	Methods	Included studies	Results	Comments
Hurley et al (2011) 'A systematic review of responsive feeding and child obesity in high-income countries' Study design Systematic review Funding National Institute of Child Health and Development Declarations of interest None to declare	Research question To summarise the evidence for associations between responsive feeding and child weight status in high-income countries; to describe responsive feeding measures; and to generate suggestions for future research Search criteria *Search dates:* 1990 to 2009 *Study design:* empirical research excluding case studies *Language:* English *Population:* 0-60 months *Intervention or exposure and comparators:* parental feeding, feeding patterns, feeding styles, eating patterns Primary outcomes Childhood overweight, weight status and growth patterns	Number of studies 31 studies, of which 3 (2 PCS, 1 repeated-measures) included participants aged 12 to 60 months. Of these 3 studies, the results from 2 that were reported in the SR have not been extracted in Annex 8 (Table A8.37) as these were from cross-sectional analyses. Number of participants The PCS of interest included 62 mother-child dyads Age of participants Participants were age 1 year at baseline and followed up after 1 year.	Results of interest for the age group covered in this report The PCS reported that pressure and restriction at age 1 year predicted lower child weight at 2 years (see Annex 8, Table A8.35 for details) Results for monitoring were not reported.	Risk of bias or quality Review did not report whether or how included studies were quality assessed. Confounding Not considered by the review authors. Limitations (from the review team) No studies identified on responsive feeding in children aged 12 to 60 months AMSTAR confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Mikkelsen et al (2014) 'A systematic review of types of healthy eating interventions in preschools' <u>Study design</u> Systematic review <u>Funding</u> None specified <u>Declarations of interest</u> None to declare	<u>Research question</u> To review published literature on healthy eating interventions in day care facilities and analyse the effectiveness of different strategies in relation to their influence on children's food choice at an early age. <u>Search criteria</u> *Search dates:* Jan 1980 to 2014 *Study design:* intervention studies *Language:* English, German, Norwegian, Swedish, Danish *Population:* healthy children aged 3-6 years (obese children were included) *Intervention and comparators:* interventions that focused on diet, nutrition, food, eating or meals in day care facilities <u>Primary outcomes</u> - Food consumption patterns, knowledge and attitude towards foods and liking and willingness to try new food. - Biological and anthropometric outcomes for example, BMI, serum cholesterol levels, skin-fold measurements, or prevalence of overweight and obesity	<u>Number of studies</u> 26 intervention studies of which 7 had a dietary or feeding component or measured child food preferences. Four of these were included in larger SRs with MAs (see Annex 6, Table A6.4 for mapping of primary studies) and were not extracted separately into Annex 8. <u>Number of participants</u> The 3 remaining studies (quasi-experimental) of interest included 38, 77 and 235 participants <u>Age of participants</u> Participants were aged 2-7 years <u>Countries</u> HIC	<u>Results of interest for the age group covered in this report</u> Effect of feeding practices on food acceptance, preferences and intake (single interventions in preschool settings) - Peer modelling (1 study) - Portion sizes (2 studies) See Annex 8, Tables A8.1 and A8.34 for detailed results No studies were identified in the age group of interest that examined anthropometric outcomes.	<u>Risk of bias or quality</u> Study quality assessed using a rating scheme adapted from Cochrane and were rated according to the level of information available, study design, risk of bias, study population and study duration. Studies were rated from weak to very strong. <u>Confounding</u> Authors did not discuss the impact of confounding due to convenience sampling and non-randomisation in the studies of interest <u>Limitations</u> (from the authors) - Single interventions generally small sample sizes, lacking controls and of relatively short duration, mostly carried out in American Caucasian families with high SES - Few studies measured changes in anthropometric outcomes – hence effectiveness of interventions on anthropometric change inconclusive - Lack of follow-up in all the interventions makes it difficult to conclude whether the observed effects were sustainable over time; longer term studies needed to assess sustainability of interventions and effect on anthropometric measurements <u>AMSTAR overall confidence rating:</u> low

Study	Methods	Included studies	Results	Comments
Mura Paroche et al (2017) 'How infants and young children learn about food: a systematic review' <u>Study design</u> Systematic review <u>Funding</u> Authors are employees of Nutricia Research <u>Declarations of interest</u> None declared	<u>Research question</u> To provide an overview of the developmental processes that are relevant to how children learn about food. To define the key gaps in the literature that need to be addressed if we are to increase our understanding of early food-related behaviour. <u>Search criteria</u> *Search dates:* February 2012 (initial search), February 2016 (additional search) *Study design:* human studies. Studies of food refusal, picky eating and other non-clinical 'problematic' feeding behaviours were included. Studies focusing on the development of a methodology were excluded, as were conference abstracts and position papers. *Population:* healthy children from weaning to 36 months old *Language:* English *Intervention or exposure and comparators:* studies relevant to a learning process in the food domain (those dealing with the pre-weaning milk-feeding period were excluded as were studies focussing on learning shown by parents, rather than children) Studies were categorised into 4 learning processes: (1) familiarisation; (2) observational	<u>Number of studies</u> 49 studies, of which 19 are within scope of this report and included participants aged 12 to 60 months. (As learning by categorisation is outside the scope of this report, data from categorisation studies were not extracted.) Of the 19 studies, 4 were included in SRs with MAs (see Annex 6, Table A6.4 for mapping of primary studies) and were not extracted separately into Annex 8. <u>Number of participants</u> The remaining 15 studies of interest, study sizes ranged from 16 to 151. More than half of the studies included <100 participants. <u>Age of participants</u> Of the 15 studies of interest, the age of	<u>Results of interest for the age group covered in this report</u> Familiarisation with unfamiliar fruits or vegetables or textures: - Repeated taste exposure to vegetables (1 study) - Repeated taste exposure to a variety of textures (2 studies) - Repeated visual exposure (3 studies) See Annex A8, Table A8.32 for details Observational learning: - Peer modelling (2 studies) - Adult modelling (3 studies) - Maternal modelling of healthy eating on child eating behaviour and interest in food (1 study) See Annex A8, Table A8.34 for details Associative learning: - Early studies of flavour-flavour learning (FFL) and flavour-nutrient learning (FNL) suggested that children's liking and intake of target foods was influenced by their association with liked tastes or satiety signals. More recent studies that have compared the effectiveness of associative learning (for example, FFL and FNL) with repeated exposure have found no added benefit of conditioning. - Other forms of associative learning, such as pairing of a food with	<u>Risk of bias or quality</u> Study quality assessed using assessment criteria adapted from Jackson et al (2008). Quality criteria included whether there was a clear description or explanation of: (1) the design; (2) the scientific background and rationale; (3) the hypotheses and objectives; (4) the sample; (5) the data analysis; (6) the findings in relation to the hypotheses and objectives; (7) the provision of attrition or exclusion data, and appropriate handling of missing data; (8) the appropriateness of the experimental procedure; (9) consideration of methodological strengths; (10) consideration of the limitations of the study, and (11) the study's relevance for theories of learning about food. The quality criteria were used to exclude low-scoring outliers. Maximum quality assessment score = 11. <u>Confounding</u> Important confounders for this topic area were not specified by the review authors, and it is unclear whether the quality assessment tool used considered bias arising from confounding <u>Limitations</u> (from the authors) - Limitation of the literature to date is its almost exclusive focus on children's consumption of vegetables and fruit. No study involving children under 3 years of age has used other under-consumed 'wholesome' foods, such as fish and whole-grain cereals, as target foods.

Study	Methods	Included studies	Results	Comments
	learning; (3) associative learning; (4) categorisation. Primary outcomes Learning about food	participants ranged from 4 months to 5 years. Countries HIC	parental reward (direct association) or pressure to eat (inverse association) have been shown to impact on young children's willingness to consume the food. See Annex A8, Table A8.34 for details Review's summary The literature is consistent in demonstrating that conditioning techniques such as FFL or FNL provide no advantage over repeated exposure in shaping the food preferences of young children in the weaning and toddler periods. Repeated exposure is the preferred way to shape food preferences. Studies in older toddlers and school-aged children indicate that direct and inverse associations may be formed with foods.	- Most studies have established only short-term effects of interventions on children's knowledge and behaviours towards foods, when longer-term influences are of primary importance - Search terms excluded studies of food-related behaviour in low-income groups and atypical populations, possibly limiting the generalisability of the conclusions AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Nekitsing et al (2018) 'Systematic review and meta-analysis of strategies to increase vegetable consumption in preschool children aged 2-5 years' Study design Systematic review and meta-analysis Funding WRDTP ESRC Collaborative Award Declarations of interest None declared	Research question To investigate the effectiveness of interventions to increase vegetable intake in children aged between 2 and 5 years Search criteria *Search dates:* January 2006 to January 2016 *Study design:* intervention studies (RCTs, experiment or pre-post format) *Language:* English *Population*: children aged 2 to 5 years *Intervention:* articles included if vegetables were the only target food group (of the intervention) or were part of a health intervention (promoting healthy eating or physical activity) *Comparison:* no restrictions Primary outcomes Change in intake of vegetables (portions, grams; measured or reported) Statistical analyses - Random-effects model - Effect size quantified by Hedge's g (SMD) - Heterogeneity (I^2 statistic; values <0.25 considered low, <0.50 considered moderate, >0.75 considered high)	Number of studies 30 intervention studies (4 RCTs, 8 cluster-RCTs, 6 cross-over trials, 6 between-subjects, 3 within-subjects, and 3 pre-post format) Number of participants Total included in MA: 4017 Sample size range of individual studies: 12 to 1154 (or 902 post-intervention) Age of participants Mean age of children 3.8 years (based on 19 studies that reported the mean age) Countries Mostly HIC (including 4 studies in the UK) Interventions - 9 strategies to promote vegetable intake (educational, taste exposure, pairing or stealth,	Main results (as reported in the SR) Effectiveness of all feeding practices (combined) - Effect of intervention vs comparison SMD 0.40 (95%CI 0.31 to 0.50; p<0.001; I^2=73.4%; 4017 participants across 30 studies) - Slightly higher effect size across 44 intervention arms of the 30 studies (SMD 0.42; 95%CI 0.33 to 0.51; p<0.001; I^2 not reported) - Sensitivity analyses excluding 3 studies (SMD 0.43; 95%CI 0.33 to 0.53; p<0.001; I^2=69.5%) - Subgroup analyses showed a reduction in dispersion but generally heterogeneity remained high Effectiveness of taste exposure - Taste exposure had a greater impact on intake than education or other strategies which were also successful but to a smaller degree. - Main effect of taste exposure appeared to be most important as taste exposure alone had a greater effect than taste exposure combined with reward, reward alone or taste exposure combined with modelling. - Taste exposure to the vegetable on its own (plain form) produced a larger impact on intake than pairing with other flavours, dips or energy. - Findings on taste exposure from 4 studies which provided at least a full portion of the vegetable to the children and measured intake in grams indicated that on average	Risk of bias or quality - Quality was assessed using the Effective Public Health Practice Project quality assessment toll for quantitative studies, which included 5 components: selection bias, study design, confounding, blinding, data collection methods, participant withdrawal and drop-outs - Funnel plot asymmetry and results of Egger's test suggested presence of publication bias Limitations (from the authors) - Significant heterogeneity observed across the 30 studies; additional subgroup analyses indicated that the moderators were possible sources (for example, type of vegetable used and intervention strategies) - Problem of multicollinearity made it difficult to determine whether taste exposure strategy or the use of an unfamiliar vegetable was more important in predicting intake - Limitation of using standardised effect size (Hedges g) is the clinical interpretation of the findings. - Limitations of the categorisation of vegetables into familiarity or liking categories include the potential overlaps between the vegetable categories (for example, a vegetable which is familiar can be disliked and unfamiliar foods are not necessarily disliked) - Literature search did not retrieve papers which specifically addressed

Study	Methods	Included studies	Results	Comments
	- Subgroup analyses conducted based on study methodology, intervention factors (intervention strategies, type of vegetable, outcome measurements, delivered by and the intervention recipient) - Meta-regression (random-effects) performed on a number of taste exposures used in the intervention - Publication bias (funnel plot and Egger's test)	provision of target foods or modification of portion size, use of rewards, modelling, choice offering, variety, visual presentation) - Type of vegetables included in the studies were classified as either: familiar or liked or unfamiliar or disliked - Intervention duration: 2 single sessions to 8 months. Comparison no treatment (or baseline consumption), usual care or received treatment after the intervention phase	children increased intake by 67g of the target vegetable (at least 1.5 portions of a child-sized portion of 40g) - Meta-regression analysis revealed that the number of taste exposures was directly associated with effect size; for a significant improvement in intake (a moderate effect of g = 0.5), children would require 8 to 10 exposures See Annex 8, Table A8.32 for detailed results.	fussy eaters even though the age range for the search included the peak period for fussy eating: future studies might investigate what specific strategies are effective in children who score high for neophobia or fussy eating - Longer term studies needed to investigate if taste exposure strategies are sustainable over time, are feasible and cost-effective at a large scale Limitations (from the review team) - Not all subgroup analyses were pre-specified in the protocol; a number of subgroup analyses were undertaken in subgroups with <5 studies - Meta-regression analysis was not pre-specified in the protocol - Main meta-analysis pooled together results from RCTs and NRSI; 20 out of the 30 included studies scored 'weak' on selection bias AMSTAR overall confidence rating low

Study	Methods	Included studies	Results	Comments
Osei-Assibey et al (2012) 'The influence of the food environment on overweight and obesity in young children: A systematic review' <u>Study design</u> Systematic review <u>Funding</u> Good Places Better Health Initiative of the Scottish Government <u>Declaration of interest</u> None to declare	<u>Research question</u> To examine the evidence for environmental influences on dietary determinants of obesity, focusing on younger children (birth to 8 years). <u>Search criteria</u> *Search dates:* up to August 2011 *Study design:* population-based intervention studies or longitudinal studies *Language:* not specified *Population:* studies were included if the majority of the children studied were under 9 years *Intervention or exposure and comparators:* exposure to one of the environmental influences on dietary determinants of obesity (9 determinants identified, including desire for high palatable foods, large portions, high-energy snack foods and SSB) <u>Primary outcomes</u> - Child adiposity (BMI or body weight, skin-fold thickness, % body fat, per cent overweight or obesity - Dietary behaviours linked to obesity	<u>Number of studies</u> 35 studies, including 5 intervention studies (2 within-subject crossover studies, 2 non-randomised controlled trial) in children aged 12 to 60 months that involved a dietary or feeding component within the intervention. One study was included in the MAs by Hodder et al (2018) and Nekitsing et al (2018) and was not extracted separately into Annex 8. <u>Number of participants</u> Of the 4 remaining studies of interest, sample sizes ranged from 17 to 70 <u>Age of participants</u> Of the 4 studies of interest, ages ranged from 2 to 6 years old at baseline	<u>Results of interest covered in this report</u> Portion sizes and child food or energy intake (3 studies) All 3 studies reported that large portion sizes increased child food or energy intake in the short term (2 to 3 months). Restrictive feeding practices and energy intake (1 study) The study did not find a relationship between restrictive feeding practices and child total energy intake See Annex 8, Tables A8.1 and A8.34 for details. No studies were identified for the age group of interest that examined child adiposity as an outcome.	<u>Risk of bias or quality</u> - Study quality was assessed using the Effective Public Health Practice Project quality assessment tool for quantitative studies. The tool was modified to take account of the design of the included studies. - 14 academic researchers and government agency staff ranked the evidence based on 1) the strength of the evidence for a causal association between the environmental factor and childhood overweight and 2) the likely effect size of public health actions on each factor on the prevalence of overweight in children. The strength of the evidence and the likely effect size of actions were rated on a scale of 0 (low) to 5 (high). - Results of the quality assessment of individual studies were not reported, although the authors did comment that several study samples in many non-RCTs and other experimental designs were convenience samples and not always representative of the target population or that only a small % of the samples agreed to participate <u>Confounding</u> The review did not consider potential confounding from convenience sampling and non-randomised study designs <u>AMSTAR overall confidence rating:</u> low

Study	Methods	Included studies	Results	Comments
		Countries HIC		

Study	Methods	Included studies	Results	Comments
Russell et al (2016) ‘Effects of parent and child behaviours on overweight and obesity in infants and young children from disadvantaged backgrounds: systematic review with narrative synthesis’ <u>Study design</u> Systematic review <u>Funding</u> Australian Government Department of Health and Ageing <u>Declarations of interest</u> None to declare	<u>Research question</u> To synthesise research on potential pathways through which disadvantaged infants and children aged up to 5 years and from OECD countries may experience greater weight gain, specifically focussing on the roles of parenting behaviours, children’s eating, children’s physical activity or sedentary behaviour as mechanisms for linking socioeconomic disadvantage and Indigenous status to greater weight gain in these groups. <u>Search criteria</u> *Search dates:* no restrictions *Study design:* studies involving human participants *Language:* English *Population*: children aged 0-5 years from low socioeconomic or Indigenous groups living in OECD countries without underlying medical conditions *Intervention:* interventions targeting parental nutrition knowledge, parenting styles or parental feeding practices in association with children’s diets (studies focussing on weight loss were excluded) <u>Primary outcomes</u> child eating behaviours or weight	<u>Number of studies</u> 32 publications reporting on 31 studies (16 CS, 13 PCS, 1 RCT, 1 pre-post intervention), of which 3 PCS examined the relationship between parental feeding practices and eating behaviours or weight in children aged 12 to 60 months. Of the 3 PCS, results of 2 were not extracted into Annex 8 because these were from cross-sectional analyses. <u>Number of participants</u> The PCS of interest included 1797 participants. <u>Age of participants</u> Participants were aged 1 to 5 years at baseline (study duration NR). <u>Countries</u> HIC	<u>Results of interest for the age group covered in this report</u> Parenting feeding practices and child weight The PCS reported no differences in feeding practices and child weight in Hispanic and non-Hispanic children after adjusting for parental and child ethnicity, and the sex of the child (see Annex 8, Table A8.35 for details).	<u>Risk of bias or quality</u> - Study quality assessed using the Mixed Methods Appraisal Tool (MMAT), comprising 2 screening questions (applied to all study designs) plus 4 questions (depending on study design) on sample selection, methods of measurement, completeness of outcome data, drop-out or follow-up rate. Quality ratings range from 0 to 4 (or 0 to 100%), where 4 (or 100%) indicates that all criteria were met. <u>Confounding</u> The SR listed covariates that were adjusted for. <u>Limitations</u> (from the authors) - Research in this area hindered by the availability of appropriate or adequate measurement tools for disadvantaged, ethnic minority populations - Clear definitions of concepts under study (for example, restriction) were often lacking and appeared to differ across studies. - As many of the parent and child behaviours associated with overweight co-occur, studies that isolate or control for confounding are needed to elucidate mechanisms of effect <u>Limitations</u> (from the review team) Follow-up time points not always reported <u>AMSTAR overall confidence rating:</u> moderate

Study	Methods	Included studies	Results	Comments
Ward et al (2015) 'Systematic review of the relationship between childcare educators' practices and preschoolers' physical activity and eating behaviour' Study design Systematic review Funding The first author funded by doctoral scholarships, including from the Canadian Institutes of Health Research Declaration of interest None to declare	Research question To identify if childcare educators' practices predict or are associated with preschoolers' physical activity and eating behaviours in childcare centres and to assess the effectiveness of interventions that control educators' practices or behaviours in order to improve preschoolers' physical activity and eating behaviours. Search criteria *Search dates:* until June 2015 *Study design:* all types of quantitative study designs (RCTs, quasi-randomised, non-randomised trials, cohorts, CC) *Language:* English or French *Population*: preschool aged children (between 2 - 5 years), receiving any type of formal, non-relative child care *Intervention:* included studies had to assess the unique contribution of childcare educators' practices or behaviours, on children's physical activity or eating behaviours Primary outcomes (of relevance to this report) - Child eating behaviours - Changes in diet or eating behaviour from baseline to follow-up (for experimental studies)	Number of studies 15 studies, of which 4 focused on nutrition and included participants aged 12 to 60 months (2 pre-post design, 2 quasi-experimental). Number of participants The 4 studies included 19 to 97 participants. Age of participants Not specified for individual studies. The authors defined 'preschooler' as any child aged 2 to 5 years old. Countries HIC	Results of interest for the age group covered in this report Feeding practices for increasing children's acceptance of unfamiliar or familiar foods (including fruits and vegetables) - Adult modelling, silent vs enthusiastic (2 studies) - Use of food or non-food rewards (2 studies) - Verbal encouragement (1 study) - Choice offering (1 study) See Annex 8, Table A8.34 for details of results.	Risk of bias or quality - Study quality assessed using the Effective Public Health Practice Project Quality Assessment Tool for Quantitative Studies. Studies were assessed for selection bias, study design, confounding, blinding, data collection and withdrawals or dropouts, leading to a 'high', 'moderate' or 'low' rating. - Strength of evidence was assessed based on study design, methodology assessment and consistency of results. Confounding factors Confounding assessed but not reported. Limitations (from the authors) - Research into interventions to improve the eating behaviours of pre-schoolers lack consideration of demographic differences between groups - Most of the studies date from 2000 and earlier - Most of the studies of interest were small and measured children's eating behaviours by direct observation, which can be highly subjective and can lack precision at the individual level AMSTAR overall confidence rating moderate

Excess weight and obesity

Table A5.5. Evidence table – excess weight and obesity

Study	Methods	Included studies	Results	Comments
Brisbois et al (2012) ‘Early markers of adult obesity: a review’ Study design Systematic review Funding Early Nutrition Committee, International Life Sciences Institute North America Declarations of interest None to declare	Research question To assess the literature to determine all potential prenatal, infant, childhood and sociodemographic markers which may have an impact on adult obesity. Search criteria *Search dates:* up to December 2009 *Study design:* quantitative studies *Language:* no restrictions *Population:* healthy children aged 0 to 5 years *Intervention or exposure and comparators:* - biomarkers as well as social determinants of health were considered (various measures of socioeconomic status, food security, gestational exposures, birth outcomes, developmental characteristics, behaviours) - variables must have been assessed at least once ≤5 years old Primary outcome Later obesity (assessed at least once in early to mid-adulthood (≥18 and ≤50	Number of studies 135 studies that examined 42 predictor variables that were identified and categorised into the following: prenatal period, infancy, early childhood and sociodemographic factors. 15 PCS reported on childhood growth patterns (early rapid growth and early adiposity rebound) and childhood obesity, which were considered within the scope of this report. Number of participants Of the 15 PCS of interest, sample sizes ranged from 155 to 4306, with 9 studies including >100 to <500 participants; 3 studies including >500 to <1000 participants and 3 studies including >1000 participants Age of participants Of the studies of interest, children were aged 1 to 5 years at baseline in most of the studies; the age when measurements were taken in adulthood was not always reported	Results of interest for the age group covered in this report Rapid early growth and risk of developing adult obesity (2 PCS) Both PCS reported an association between rapid early growth and risk of developing adult obesity (see Annex 8, Table A8.36 for details) Age at adiposity rebound and risk of developing adult obesity (4 PCS) All 4 PCS reported an association between early adiposity rebound (≤5 years of age) and higher risk of developing adult obesity (see Annex 8, Table A8.36 for details). Childhood obesity and adult overweight or obesity (11 PCS) 10 of 11 PCS reported a direct association between child BMI or overweight or obesity and (risk of) adult overweight or obesity (see Annex 8, Table A8.36 for details). Conclusions of review authors	Risk of bias or quality Study quality not formally assessed by validated questionnaire although the review authors did consider: - statistical rigour, including type of statistics completed and if adjustments were made for confounding variables - type of study (prospective vs retrospective) with the former considered more rigorous - measured vs self-reported variables, with the former considered more objective and reliable A variable was considered a ‘possible’ or ‘probable’ early marker of adult obesity if the underlying studies met all the above criteria. A ‘possible’ marker was defined as 6 to 10 studies that reported a positive relationship in >80% of the studies; a ‘probable’ marker was defined as 6 to 10 studies that reported a positive relationship in 100% of the studies Confounding Although the authors noted whether analyses had adjusted for confounding, key confounding factors were not listed in their evidence tables or

Study	Methods	Included studies	Results	Comments
	years of age) measured by BMI, waist circumference, wait-to-hip ratio, % body fat	Countries HIC	Strong, consistent findings were observed for childhood growth patterns and childhood obesity.	discussed in the body of the report. Limitations (from the authors) - Many cohorts were initiated in the early half of the 20th century; as the obesity epidemic is a relatively recent phenomenon (last 3 decades), the environmental determinants of obesity may have changed substantially over the last 90 years. AMSTAR overall confidence rating: critically low

Study	Methods	Included studies	Results	Comments
Llewellyn et al (2016) 'Childhood obesity as a predictor of morbidity in adulthood: a systematic review and meta-analysis' Study design Systematic review and meta-analysis Funding National Institute for Health Research Health Technology Assessment Programme Declarations of interest None to declare	Research question To investigate the ability of childhood BMI to predict obesity-related morbidities in adulthood. Search criteria *Search dates:* up to June 2013 *Study design:* longitudinal cohort studies with at least 1000 participants at follow-up *Language:* no restrictions *Population:* no information on age or health condition *Intervention or exposure and comparators:* obesity in childhood Primary outcome Morbidities occurring in adulthood: cardiovascular diseases, hypertension, type II diabetes, metabolic syndrome or cancer. Statistical analyses - Outcomes pooled (if pre-specified morbidities were reported in ≥2 cohorts): adult-onset type II diabetes, coronary heart disease, stroke, hypertension, breast cancer. - Due to variation in reporting results, study estimates were converted into odds ratio (OD) per standard deviation	Number of studies 37 studies (reporting on 22 PCS). 7 PCS that included children aged ≤6 years at baseline were included in subgroup MAs for the following adult outcomes: - Diabetes (1 PCS) - CHD (3 PCS) - Stroke (3 PCS) - Breast cancer (1 PCS) No studies in children aged ≤6 years were included in the subgroup analysis of childhood BMI and hypertension Sensitivity analyses performed only on 7-11 and 12-18 age groups. Countries HIC (studies of interest)	Results of interest for the age group covered in this report Diabetes (1 PCS) OR 1.23; 95% CI 1.10 to 1.37; p-value and number of participants not reported (see Annex 8, Table A8.37 for details). Coronary heart disease (3 PCS) OR 0.97; 95% CI 0.85 to 1.10; I^2=52%; p-value and number of participants not reported (see Annex 8, Table A8.37 for details). Stroke (3 PCS) OR 0.94; 95% CI 0.75 to 1.19; I^2=58%; p-value and number of participants not reported (see Annex 8, Table A8.37 for details). Breast cancer (1 PCS) OR 0.88; 95% CI 0.67 to 1.16; p-value and number of participants not reported (see Annex 8, Table A8.37 for details). To note: it was unclear which studies were included in the subgroup analyses. The SR also reported that, despite finding an association between higher BMI in childhood and cardiovascular risk in	Risk of bias or quality Quality assessed using a modified version of the QUIPS checklist including assessment of selection bias, attrition bias, measurement bias, reporting bias and bias from confounding Confounding Review authors did not list key confounders but they did state that, where possible, results from models adjusted for confounding factors were used in the meta-analyses; models adjusted for adult obesity were not considered as the focus was to examine the association between childhood obesity and morbidity without knowledge of later adult obesity. Limitations (from the review authors) - Many identified cohorts commenced in the 1920s and 1950s but social conditions for children have changed considerably since that time; it is unclear whether the association between childhood BMI and adult morbidity from such cohorts accurately reflects the association in present-day children - Assumption of normality for BMI may be inaccurate; estimates of ORs should not be

Study	Methods	Included studies	Results	Comments
	(SD) of BMI to calculate pooled OR (random-effects model). The authors noted the following limitation with this approach – that it assumes that BMI follows a normal distribution and that the SD of BMI is the same in people with or without comorbidities.		adulthood (which generally increased with childhood age: 7 to 11, 12 to 18 years) the increase in risk was not large enough for childhood BMI to be a good predictor of adult morbidities as the majority of adult obesity-related morbidities occurred in adults who were of healthy weight in childhood (although no analysis was performed in children aged ≤6 years)	considered to be exact or definitive but instead indicate the general trend in results - Some cohorts may not have had sufficiently long follow-up to fully capture adult morbidity-related events AMSTAR overall confidence rating: critically low

Table A5.6. Evidence table – oral health

Study	Methods	Included studies	Results	Comments
Baghlaf et al (2018) ‘Free sugars consumption around bedtime and dental caries in children: a systematic review’ Study design Systematic review of observational studies Funding No funding to declare Declaration of interest None to declare	Research questions (1) Does food or drink consumption at bedtime increase the risk of dental caries in children? (2) Does consuming foods containing free sugars at bedtime increase the risk of dental caries in children? (3) Does consuming drinks containing free sugars at bedtime increase the risk of dental caries in children? Search criteria *Search dates*: up to May 2017 *Study design*: RCTs, non-RCTs, prospective and retrospective cohort studies, case control studies, and cross-sectional studies *Language*: English *Population*: healthy children aged 3 to 16 years *Exposures*: any food and drink consumption around bedtime or before sleep – specifically, consuming food or drinks containing free sugars around bedtime. *Comparator*: no comparison group or a control group not exposed to food or drink around bedtime.	Number of studies 18 studies (4 PCS, 1 CC, 15 CS), of which 1 PCS included participants aged 12 to 60 months. Number of participants The PCS of interest included 1782 participants Age of participants Participants were aged 3 to 6 years at baseline and followed up after 12 months Countries HIC	Main result for the age group covered in this report The PCS of interest reported an association between the consumption of sweets at bedtime in children aged 3 to 6 years with greater odds of dental caries (see Annex 8, Table A8.38 for details). No studies were identified in children aged 12 to 60 months on consumption of drinks containing free sugars at bedtime and dental caries risk.	Risk of bias or quality - Study quality assessed using the AHRQ system and rated as ‘good’, ‘fair’ or ‘poor’ (domains assessed included: study population, comparability of subjects, outcome measurement, statistical analysis, funding). - The quality of the evidence evaluated using GRADE, and rated ‘high’, ‘moderate’, ‘low’ or ‘very low’. - Publication bias (funnel plot) could not be assessed. Confounding factors - The authors identified key confounders for all included studies. For the study of interest, the confounders identified were frequency of between-meal sweets, plaque index, toothbrushing and fluoride. AMSTAR overall confidence rating: high

Study	Methods	Included studies	Results	Comments
	Primary outcomes Dental caries or ECC assessed through clinical examination (as measured by DMFT, dmft, DMFS, dmfs, DFS, deft or by comparisons between caries or no caries groups or higher and lower caries groups).			

Study	Methods	Included studies	Results	Comments
Hermont et al (2015) ‘Breastfeeding, bottle feeding practices and malocclusion in the primary dentition: a systematic review of cohort studies’ <u>Funding</u> Research Foundation of the State of Minas Gerais (FAPEMIG), National Council of Technological and Scientific Development (CNPq), Brazilian Coordination of Higher Education, Brazilian Ministry of Education (CAPES), Pro-Reitoria de Pesquisa da UFMG (PRPq/UFMG). <u>Declaration of interest</u> None to declare	<u>Research question</u> Is bottle feeding associated with malocclusion in the primary dentition when compared to breastfeeding? <u>Search criteria</u> *Search dates:* no restrictions *Study design:* PCS *Language:* no restrictions *Population:* children in the primary dentition phase *Exposure:* bottle feeding *Comparator:* breastfeeding <u>Primary outcome</u> Malocclusion (MO)	<u>Number of studies</u> 10 PCS, of which 3 examined the association between breastfeeding or bottle feeding (>12 months) and MO risk. To note that the results of 2 of the 3 studies of interest were also reported in Thomaz et al 2018 and have not been extracted here. <u>Number of participants</u> The PCS of interest included 120 participants at baseline and 80 at follow-up <u>Age of participants</u> Participants were aged 12 months at baseline and followed up at age 30 months <u>Countries</u> UMIC	<u>Results of interest for the age group covered in this report</u> The PCS of interest reported an association between bottle feeding at 12 months and 30 months and posterior crossbite at 12 months and 30 months (see Annex 8, Table A8.43)	<u>Risk of bias or quality</u> - Study quality assessed using Newcastle Ottawa Scale with the lowest possible grade=0 and the highest possible grade=10 - Publication bias was not quantitatively evaluated as there were not enough studies to be grouped in a funnel plot. <u>Confounding factors</u> The study of interest did not control for confounding factors such as non-nutritive sucking habits. <u>Limitations</u> (from the authors) - Oral examinations conducted only once (at the end of the study); the lack of follow up throughout the study period did not allow the determination of whether malocclusion underwent changes over the years or the age that malocclusion began. - None of the studies included in the review performed a baseline oral examination to ensure that the participants were free of malocclusion. <u>AMSTAR overall confidence rating</u>: moderate

Study	Methods	Included studies	Results	Comments
Hooley et al (2012a) ‘Body mass index and dental caries in children and adolescents: a systematic review of literature published 2004 to 2011’ Study design Updated systematic review of observational studies. Funding Not specified. Declaration of interest None to declare.	Research questions - What do studies reveal about the association between dental caries and BMI in children and adolescents? - What are the methodological limitations of the current approaches to investigating the development of both dental caries and obesity and what may be valuable directions for future research? Search criteria *Search dates:* January 2004 to June 2011 *Study design:* not specified *Language:* not specified *Population:* children and adolescents to age 18 years *Exposure:* some form of weight-to-height ratio to estimate body fat, for example, BMI, body fat index (DXA), Division of Nutrition, Thai Ministry of Public Health standards using weight-for-height in Thai children Primary outcome Measured caries rates	Number of studies 48 studies (8 PCS, 1 CC, 38 CS, 1 retrospective case study) in 47 publications; 3 PCS included participants aged 12 to 60 months at baseline, of which 1 performed cross-sectional analyses which were not extracted here. Number of participants See results column Age of participants See results column Countries HIC	Results of interest for the age group covered in this report Both PCS reported a direct association between child BMI and dental caries (see Annex 8, Table A8.44 for details) The review authors noted that the study did not provide sufficient detail about the sample and the regression model assumed a linear relationship. The sample therefore appeared to be positively skewed for dental caries and negatively skewed for BMI or body weight, with underweight participants significantly under-represented ($p<0.05$) compared with studies finding an inverse association or no association between BMI or body weight and dental caries.	Risk of bias or quality Studies evaluated on 3 criteria: representativeness of sample, control of potential confounding variables, quality of assessment of child weight-to-height and dental caries. Confounding factors The review authors noted that factors that might moderate the association between BMI and caries prevalence and severity rates include age, consuming sweets, soda pop, sugar, socioeconomic status, ethnicity, parents’ attitudes to dental health, parental education, and maternal BMI. AMSTAR overall confidence rating: low

Study	Methods	Included studies	Results	Comments
Hooley et al (2012b) ‘Parental influence and the development of dental caries in children aged 0-6 years: a systematic review of the literature’ Study design Systematic review of all studies testing associations between dental caries in children 0-6y. Funding Not specified Declaration of interest Not specified	Research questions - What parental variables have been studied within the context of dental caries development in young children aged 0-6y? - What do such studies reveal about the influence of parental variables on risk factors for dental caries in young children? - What are the relative strengths and limitations of current approaches to research studying the influence of parental variables in development of dental caries? - What recommendations can be made for future research? Search criteria *Search dates:* from 2006 to 2011 *Study design:* not specified *Language:* no restriction *Population*: children aged 0-6 years old *Exposures*: parental factors were grouped into 6 categories: 1) parental socio-economic factors 2) parental feeding practices of children 3) parental behaviours relating to initiation and maintenance of oral hygiene practices and developing of a healthy relationship with dental professionals	Number of studies 55 studies (7 PCS, 1 CC, 47 CS). Of the 6 exposure categories, only parent-child feeding practices were considered within scope of this report. 7 PCS that examined this exposure included participants aged 12 to 60 months at baseline. Number of participants Of the 7 studies of interest, sample sizes ranged from 56 to 1576 Age of participants Most studies of interest included participants aged 18 months to 5 years. Population Majority conducted in HIC and UMIC	Results of interest for the age group covered in this report Parental-child feeding practices and ECC - Sugars-containing foods and drinks and ECC (3 PCS) - Breastfeeding >12 months (1 PCS) - Use of bottles for milk feeds (2 PCS) - Night time bottle feeding (2 PCS) See Annex 8, Tables A8.38 to A8.42 for detailed results	Risk of bias or quality - RoB assessed across 3 methodological attributes: dental caries diagnosis, statistical analysis (including whether potential confounding was controlled for) and sample characteristics (how representative samples were of the population under study); and ranked (A = highest possible rank; G = lowest possible rank). Confounding factors - Of the 7 studies of interest, 3 studies that reported statistical significance attempted to control for confounding while 4 studies that reported statistical significance did not. The review authors did not specify the confounding factors. Limitations (from the authors) - Considerable disparity in dental caries diagnostic criteria between studies: dental caries measured at cavity level, or pre-cavity level, or use of parental report to determine caries level or left unspecified. Majority of studies overlooked the presence of white-spot lesions, an important indicator of ECC; ECC prevalence will be underestimated as a result

Study	Methods	Included studies	Results	Comments
	4) parental attitudes, knowledge and beliefs influencing parenting practice 5) parental attributes relating to relatively stable characteristics of the parent or caregiver that may influence the environment of the child 6) parental oral health status <u>Primary outcome</u> ECC, measure of dental caries prevalence or severity			and increases the likelihood of type 2 error. - Most commonly-explored parenting factors were demographic factors and feeding practices – little research into parents' attitudes, knowledge and beliefs. <u>Limitations</u> (from the review team) - Review did not provide quantitative data from the included studies making it difficult to assess the strength or magnitude of associations <u>AMSTAR overall confidence rating</u>: critically low

Study	Methods	Included studies	Results	Comments
Moynihan and Kelly (2014) 'Effect on caries of restricting sugars intake: systematic review to inform WHO guidelines' <u>Study design</u> Systematic review of interventions and observational studies. <u>Funding</u> Newcastle University's Centre for Oral Health Research <u>Declaration of interest</u> None to declare.	<u>Research questions</u> - What is the effect on dental caries of reducing or increasing free sugars intake in children? - What is the effect on dental caries of restricting sugars intake to below 10% energy to reduce risk of dental caries in children? • To note that the research questions were also applied to adults. <u>Search criteria</u> *Search dates*: 1950 to November 2011 *Study design*: RCTs, intervention studies, and observational studies; reviews were included if they contained a new analysis of existing data *Language*: no restriction *Population*: healthy individuals (without acute illness, but those overweight or with hypertension or diabetes could be included) in developing, transitional, or industrialised countries; all age groups included *Exposures and comparators*: any intervention intended to alter sugars intake in one arm of the study compared with diet with a different sugars content in another study arm; observational studies were included if they reported absolute sugars or change in sugars intake; all timescales were included; sugars defined as any of total sugars, free sugars, added	<u>Number of studies</u> 55 studies (1 intervention, 8 PCS, 20 population studies, 26 CS) of which 4 PCS included participants aged 12 to 60 months. <u>Number of participants</u> Of the 4 PCS of interest, 1 included >100 participants, 1 included >250 participants, 2 included >500 participants <u>Age of participants</u> Of the 4 PCS of interest, children were aged 1 to 4 years at baseline with follow-up time ranging from 1 to 4 years. <u>Countries</u> HIC and UMIC	<u>Results of interest for the age group covered in this report</u> Effect of increasing free sugars' intake on caries (4 PCS) - 3 of 4 PCS reported that higher higher sugars intake was associated with higher dental caries. Effect of restricting free sugars' intake to <10% energy on caries (2 PCS) - Both PCS reported an association between sugars intake >10% energy and higher caries compared with sugars intake <10% energy See Annex 8, A8.40 for detailed results.	<u>Risk of bias or quality</u> - Quality of the evidence assessed using GRADE. Evidence quality classified as 'high', moderate, 'low' or 'very low'. - GRADE assessments based on cohort studies only. <u>Confounding factors</u> - Fluoride exposure accounted for in all the 4 studies of interest - Unclear whether the review authors systematically assessed RoB due to confounding factors other than fluoride exposure <u>Limitations</u> (from the authors) - In the absence of RCTs with which to conduct funnel plots and limited possibility to combine data, publication bias was difficult to assess. <u>Limitations</u> (from the review team) - Unclear which method was used to assess RoB in the included studies, particularly selection and attrition bias. <u>AMSTAR overall confidence rating</u>: high

Study	Methods	Included studies	Results	Comments
	sugars, sucrose, non-milk extrinsic sugars, expressed as g or kg per day or per year or as % of energy Primary outcomes Caries prevalence, incidence or severity (measured as DMF index, DMFT, dmft, DMFS, dmfs, deft, dft, or comparison between caries and no caries or higher caries vs lower caries)			

Study	Methods	Included studies	Results	Comments
Tham et al (2018) 'Breastfeeding and the risk of dental caries: a systematic review and meta-analysis' Study design Systematic review, meta-analysis and narrative synthesis. Funding World Health Organization Declaration of interest None to declare.	Research question To summarise the current evidence for the association between breastfeeding and dental caries, with reference to specific windows of early childhood caries risk. Search criteria *Search dates:* until 2 October 2014 *Study design:* observational and experimental studies published in full text *Language:* English *Population*: children and adolescents from both general and high-risk populations (for example, low socioeconomic communities) *Interventions or exposures:* breastfeeding compared with formula or other feeding Primary outcome Development of dental caries in deciduous or permanent teeth Meta-analysis - Random effects model used if heterogeneity I^2 >25%. - Heterogeneity (I^2) considered high if I^2=75%.	Number of studies 63 studies (14 PCS, 6 nested within RCTs of breastfeeding promotion interventions; 3 CC; 46 CS), of which 4 PCS examined the relationship between breastfeeding >12 months on caries risk in primary dentition and 1 PCS investigated the effect of breastfeeding >12 months on caries risk in primary and permanent dentition Number of participants Of the 4 PCS of interest, the sample sizes ranged from 163 to 922, with most studies between 300 to 500. 1 PCS did not report the number of children enrolled in the study but did report the number of pregnant women in the study (n=715). Age of participants Of the 4 PCS of interest, 38 months to 10 years at follow up. Countries HIC and UMIC	Results of interest for the age group covered in this report 2 of 2 PCS reported that BF for 12 months and longer was not associated with later ECC or S-ECC risk compared with BF for <6 months 3 of 3 PCS reported that BF for 18 months and longer was directly associated with ECC risk compared with not BF at 18 months. 2 of 2 PCS reported that BF for 24 months and longer was directly associated with ECC risk compared with not BF at 24 months See Annex 8, Table A8.39 for detailed results.	Risk of bias or quality - Study quality assessed using the Newcastle Ottawa Scale, with a maximum score = 10 (for PCS) and =7 (for CS). - Studies classified 'unsatisfactory' (scoring <4); 'satisfactory' (scoring 4 but lacking consideration of key confounders). Higher quality studies (scoring ≥5) were limited by how exposure was ascertained as many studies used self-report questionnaires. - Assessment of RoB guided by the GRADE assessment of evidence quality. -Unable to quantitatively assess publication bias as no group contained more than 10 studies. Confounding factors - Authors identified socio-economic status, age, mother's educational level, number of teeth, and exposure to sugar in the diet (food or other liquid) as key confounders. - Only a few studies controlled for key confounders, which may have resulted in an overestimation of the role of prolonged, frequent and nocturnal breastfeeding in the development of dental caries.

Study	Methods	Included studies	Results	Comments
				Limitations (from the authors) - A lack of studies on children aged >12 months that simultaneously assessed caries risk in breastfed, bottle-fed and children not bottle or breastfed, alongside specific breastfeeding practices, consuming sweet drinks and foods, and oral hygiene practices limiting the authors' ability to tease out the risks attributable to each. Limitations (from the review team) - Not enough studies to perform meta-regression for formal investigation of heterogeneity. - Meta-analyses pooled results from different study types of varying quality. - Subgroup or sensitivity analyses were not conducted by NOS score to assess the impact of RoB on the main results. AMSTAR overall confidence rating: low

Study	Methods	Included studies	Results	Comments
Thomaz et al (2018) 'Breastfeeding versus bottle feeding on malocclusion in children: a meta-analysis study' Study design Systematic review and meta-analysis of observational studies. Funding National Counsel of Technological and Scientific Development (CNPq); the Foundation for Scientific Research and Development of Maranhão (FAPEMA) Declaration of interest None to declare.	Research question Are the type and duration of breastfeeding, compared with other forms of feeding, associated with malocclusion (MO) in primary teething in observational studies? Search criteria *Search dates*: up to December 2015 *Study design*: observational studies *Language*: no restrictions *Population*: children of both genders aged 0-7 years with primary teeth *Exposures*: breastfeeding and exclusive breastfeeding *Comparators*: non-breastfed children or those who were bottle fed Primary outcomes MO, such as nonspecific MO, anterior and posterior open bite, anterior and posterior crossbite, overbite, overjet, crowding and molar and canine relationships, or others. Meta-analysis - All types of MO were combined and analysed as one outcome. - Random-effects model - Subgroup analysis according to study design and MO type - Sensitivity analysis performed by excluding studies with a high RoB - Publication bias (funnel plots and the inclusion of unpublished studies).	Number of studies 42 studies (32 CS, 6 PCS and 4 nested PCS) of which 8 studies (3 PCS or nested PCS, 5 CS) investigated breastfeeding ≥12 months and MO. Only MA of estimates from PCS (n=3) was considered. Number of participants 419 participants in the 3 PCS that investigated breastfeeding ≥12 months. Age of participants Of the 3 studies of interest, participants were aged from 3 to 5 years old Countries UMIC and HIC (studies of interest)	Results of interest for the age group covered in this report Breastfeeding (≥12 months) and MO Subgroup MA of 3 PCS or nested PCS (n=419): OR 0.38; 95% CI 0.24 to 0.60; p<0.0001 (I^2=0) Breastfeeding (≥12 months) and type of MO - Subgroup analysis of 2 PCS (n=272) showed that breastfeeding (≥12 months) was associated with a decreased risk of overjet: OR 0.30; 95% CI 0.16 to 0.57; p=0.0003 (I^2=0) - No association with crossbite (anterior or posterior) - A lack of adequate studies prevented the estimation of summary measures of associations with other types of MO.	Risk of bias or quality - RoB assessed using the Quality Assessment Tool (QAT) for Observational Cohort and Cross-Sectional studies, which contains 14 items (unspecified). - Funnel plots suggested publication bias favouring studies with significant results. Confounding factors The review authors noted that non-nutritive sucking habits may take part in a causal pathway for a possible association between breastfeeding and MO, and therefore should not be adjusted as confounders but rather understood as mediators. AMSTAR overall confidence rating: moderate

Annex 6: Overlap between identified systematic reviews (SRs)

Energy and macronutrients

Table A6.1. Overlap between SRs on carbohydrate intake and body weight and composition

Primary study (first author, year)[1]	Frantsve-Hawley (2017)	Hornell (2013)	Luger (2017)	Parsons (1999)	Perez-Morales (2013)	Te Morenga (2012)	Overlap
Cantoral (2015)			X				1
Chaidez (2014)			X				1
De Boer (2013)	X		X				2
De Coen (2014)	X						1
Dubois (2007)	X				X	X	3
Faith (2006)	X					X	2
Guerrero (2016)	X						1
Hasnain (2014)	X		X				2
Herbst (2011)					X	X	2
Kral (2008)					X		1
Kuhl (2014)	X						1
Lim (2009)	X					X	2
Millar (2014)	X				X		2
Newby (2004)	X				X		2
Rolland-Cachera (1995)				X			1
Scaglioni (2000)		X					1
Shefferly (2016)	X						1
Skinner (1999)	X						1
Skinner (2001)	X				X	X	3
Skinner (2004)		X					1
Sonneville (2015)	X		X				2
Weijs (2011)	X					X	2
Welsh (2005)	X				X	X	3
Wheaton (2015)	X						1
Williams (2008)						X	1
Zheng (2015)	X		X				2
Total	18	2	6	1	7	8[2]	

[1] Only primary studies (RCTs or PCS) that included children aged 12 to 60 months at baseline are listed.

[2] Five of the 8 studies included in the MA by Te Morenga et al (2012) referenced in the main report.

Micronutrients

Table A6.2. Overlap between SRs on iron fortification and iron status

Primary study (first author, year)	Athe (2013)[1]	Das (2013)[1,2]	Eichler (2012)[1,2]	Hojsak (2018)[3]	Matsuyama (2017)[1]	Pratt (2015)[3]	Ramakrishnan (2009)a[1]	Overlap
Abizari (2012)		X						1
Andang'o (2007)	X	X						2
Akkermans (2017)				X				1
Arcanjo (2010)		X						1
Bagni (2009)		X						1
Barbosa (2012)		X						1
Barth-jaggi (2014)								1
Beinner (2005)	X	X						2
Bradley (1993)	X							1
Chen (2005)		X						1
Daly (1996)		X	X		X			3
De Almeida (2003)	X							1
De Almeida (2005)		X						1
De Oliveira (1996)	X							1
Faber (2005)		X	X					2
Gibson (2011)			X					1
Gill (1997)		X	X				X	3
Giorgini (2001)	X	X						2
Haschke (1998)		X						1
Huo (2002)		X						1
Jack (2012)						X		1
Jaivad (1991)							X	1

Primary study (first author, year)	Athe (2013)[1]	Das (2013)[1,2]	Eichler (2012)[1,2]	Hojsak (2018)[3]	Matsuyama (2017)[1]	Pratt (2015)[3]	Ramakrishnan (2009)a[1]	Overlap
Lartey (1999)			X					1
Le Huong Thi (2006)	X	X						2
Liu(1993)			X					1
Longfils (2008)		X						1
Lundeen (2010)						X		1
Maldonado Lonzano (2007)			X					1
Marsh (1995)		X						1
Moffatt (1994)		X						1
Moreira-Araujo (2007)	X							1
Moretti (2006)	X	X						2
Morley (1999)		X	X		X		X	4
Muthayya (2012)		X						1
Nga (2009)	X							1
Nogueria (2012)		X						1
Nogueria (2012)		X						1
Osei (2010)	X							1
Rim (2008)	X	X						2
Rivera (2010)			X		X	X		3
Rosado (2010)						X		1
Sari (2001)	X	X						2
Sazawal (2010)	X		X		X			3
Schumann (2005)		X	X					2
Shamah Levy (2008)		X						1
Singhal (2000)					X			1
Stevens (1995)		X			X			2
Stevens (1998)			X					1
Szymlek-Gay (2009)		X		X	X	X		4

Primary study (first author, year)	Athe (2013)[1]	Das (2013)[1,2]	Eichler (2012)[1,2]	Hojsak (2018)[3]	Matsuyama (2017)[1]	Pratt (2015)[3]	Ramakrishnan (2009)a[1]	Overlap
Van Stuijvenberg (2001)	X							1
Van Stuijvenberg	X							1
Varma (2007)	X							1
Villalpando (2006)			X		X	X		3
Virtanen (2001)		X	X		X			3
Walter (1993)		X						1
Walter (1993)		X						1
Walter (1998)			X					1
Xuan					X			1
Zimmerman (2010)		X						1
Zimmerman (2006)	X							1
Total	18	33	15	2	10	6	3	

[1] Findings not stratified by baseline status.
[2] % weighting of MAs from studies in children outside of 12 to 60 month range.
[3] No MA.

Foods, dietary components, and dietary patterns

Table A6.3. Overlap between SRs on milk and dairy

Primary study (first author, year)[1]	De Beer (2012)	Dougkas (2019)	Dror and Allen (2014)	Overlap
Braun, 2016		X		1
Carruth and Skinner, 2001		X	X	2
DeBoer, 2014		X		1
DeJongh, 2006		X		1
Faith, 2006		X		1
Garden, 2011		X		1
He, 2005	X			1
Huh, 2010		X	X	2
Huus, 2009		X		1
Kral, 2008		X		1
Marshall, 2003			X	1
Moore, 2005			X	1
Moore, 2006		X	X	2
Moore, 2008			X	1
Newby, 2004		X	X	2
Rangan, 2012		X	X	2
Hasnain 2014		X		1
Scharf, 2013		X		1
Skinner, 2003		X		1
Total	1	14	8	

[1] Only primary studies (RCTs or PCS) that include children aged 12 to 60 months at baseline are listed.

Eating and feeding behaviours

Table A6.4. Overlap between SRs on caregiver feeding practices or styles

Primary study (first author, year)	Bergmeier (2015)	Blondin (2016)	Campbell (2007)	Hodder (2018)	Holley (2017)	Hurley (2011)	Mikkelsen (2014)	Nekitsing (2018)	Osei-Assibey (2012)	Mura Paroche (2017)	Peters (2012)	Russell (2016)	Skouteris (2011)	Ward (2015)	Over-lap
Addessi (2005)										X					1
Anzman-Frasca (2012)				X											1
Bayer (2009)							X								1
Bell (2015)								X							1
Birch (1980)							X			X					2
Birch (1987)										X					1
Black (2011)[3]				X											1
Blissett (2016)				X											1
Blossfeld (2007a)										X					1
Blossfeld (2007b)										X					1
Bouhlah (2014)					X			X		X					3
Branen and Fletcher (1994)														X	1
Brouwer (2013)							X	X							2
Brown and Harris, 2012										X					1
Capaldi-Phillips (2014)					X										1
Caton (2013)				X				X		X					3
Caton (2014)										X					1
Chaidez and Kaiser (2011)												X			1

Primary study (first author, year)	Bergmeier (2015)	Blondin (2016)	Campbell (2007)	Hodder (2018)	Holley (2017)	Hurley (2011)	Mikkelsen (2014)	Nekitsing (2018)	Osei-Assibey (2012)	Mura Paroche (2017)	Peters (2012)	Russell (2016)	Skouteris (2011)	Ward (2015)	Over-lap
Cohen (1995)[1]				X											1
Cooke (2011)				X											1
Correia (2014)				X	X			X							3
Cravener (2015)				X				X							2
Daniels (2014)[1]				X											1
De Bock (2011)				X			X								2
De Coen (2012)				X											1
De Droog (2014)[4]				X											1
De Droog (2017)[4]				X											1
De Wild (2013)				X	X			X		X					4
De Wild (2015a)				X	X			X							3
De Wild (2015b)				X	X										2
De Wild (2017)[4]				X											1
Dennison (2004)[1]			X										X		2
Duncanson (2013)[3]				X											1
Edelson (2016)										X					1
Farrow and Blissett (2008)						X									1
Faith (2006)						X						X			2
Fildes (2014)				X				X							2
Fildes (2015)[1]				X											1
Fisher (2003)									X						1
Fisher (2012)				X	X			X							3
Galloway (2006)						X									1
Gregory (2010)										X					1
Gripshover (2013)					X			X							2

Primary study (first author, year)	Bergmeier (2015)	Blondin (2016)	Campbell (2007)	Hodder (2018)	Holley (2017)	Hurley (2011)	Mikkelsen (2014)	Nekitsing (2018)	Osei-Assibey (2012)	Mura Paroche (2017)	Peters (2012)	Russell (2016)	Skouteris (2011)	Ward (2015)	Over-lap
Fitzgibbon (2005, 2006)[3]			X								X		X		3
Haire-Joshu (2008)[3,4]				X							X		X		3
Harnack (2012)				X	X		X	X						X	5
Harper and Sanders (1975)										X					1
Harvey-Berino and Rouke (2003)[4]			X								X		X		3
Hausner (2012)				X	X			X		X					4
Heath (2014)				X						X					2
Hendy (1999)														X	1
Hendy (2000)														X	1
Hendy (2002)							X								1
Hetherington (2015)[1]				X											1
Holley (2015)					X[4]			X							2
Houston-Price (2009)										X					1
Horne (2011)					X			X							2
Horodynski and Stommel (2005)[4]			X								X		X		3
Ireton and Guthrie (1972)														X	1
Johnson (1991)										X					1
Keller (2012)[1]				X											1
Kling (2016)				X											
Kupers (2014)		X													1

Primary study (first author, year)	Bergmeier (2015)	Blondin (2016)	Campbell (2007)	Hodder (2018)	Holley (2017)	Hurley (2011)	Mikkelsen (2014)	Nekitsing (2018)	Osei-Assibey (2012)	Mura Paroche (2017)	Peters (2012)	Russell (2016)	Skouteris (2011)	Ward (2015)	Over-lap
Lim (2011)												X			1
Looney (2011)									X						1
Lumeng and Hillman (2007)										X					1
Lumeng (2012)	X														1
Lundy (1998)										X					1
Martinez-Andrade (2014)^{3,6}				X				X							2
McGarvey (2004)^{3}			X								X		X		3
Namenek Brouwer (2013)^{5}				X											1
Natale (2014)^{5}				X											1
Nicklas (2017)^{5}				X											1
O'Connell (2012)				X			X								2
Ramsey (2013)							X								1
Reinaerts (2007)								X							1
Remington, (2012)				X	X			X							3
Roe (2013)				X	X			X							3
Rolls (2000)									X						1
Roset-Salla (2016)^{3}				X											1
Sacher (2008)^{7}											X				1
Savage (2012)				X				X							2
Savage (2013)								X							1
Sharma (2011)								X							1
Sherwood (2015)^{3}				X											1
Sirikulchaya-nonta (2010)								X							1

Primary study (first author, year)	Bergmeier (2015)	Blondin (2016)	Campbell (2007)	Hodder (2018)	Holley (2017)	Hurley (2011)	Mikkelsen (2014)	Nekitsing (2018)	Osei-Assibey (2012)	Mura Paroche (2017)	Peters (2012)	Russell (2016)	Skouteris (2011)	Ward (2015)	Over-lap
Skouteris (2015)[3]				X											1
Smith (2017)				X											1
Spill (2010)				X				X	X						3
Spill (2011a)				X				X							2
Spill (2011b)				X	X			X							3
Staiano (2016)				X	X										2
Sud (2010)									X						1
Tabak (2012)[3]				X				X							2
Thompson (2013)												X			1
Verbestel (2014)[3]				X											1
Vereecken (2009)				X				X							2
Wardle (2003)			X	X							X		X		4
Wijtzes (2013)												X			1
Williams (2014)				X				X							2
Witt and Dunn (2012)				X	X			X							3
Worobey (2004)[3]			X								X				2
Wyse (2012)[3]				X	X										2
Zeinstra (2018)				X											1
Total	1	1	7	52	18	3	8	30	5	19	8	5	7	5	

[1] Participants aged <1 year but included in MA by Hodder et al (2018).

[2] Excluded from consideration because the study did not measure dietary intake.

[3] Excluded from consideration because the intervention targeted parental or child nutrition knowledge (without a dietary or feeding style component) or food provision.

[4] Excluded from consideration because the study did not directly link changes in feeding practices or styles to changes in children's eating behaviours or body weight.

[5] Excluded from consideration because the intervention did not involve a dietary or feeding component.

[6] Excluded from consideration because the intervention involved weight management.

[7] Excluded from consideration because details of the intervention were not reported.

Oral health

Table A6.5. Overlap between SRs on sugars intake and dental caries

Primary study (first author, year)[1]	Baghlaf (2018)	Hooley (2012)	Moynihan and Kelly (2014)	Overlap
Battellino (1997)			X	1
Fontana (2011)		X		1
Gao (2010)	X	X		2
Karjalainen (2001)			X	1
Mackeown (2000)			X	1
Meurmann (2010)		X		1
Ohsuka (2009)		X		1
Rodrigues (1999)			X	1
Total	1	4	4	

[1] Only primary studies (RCTs or PCS) that include children aged 12 to 60 months at baseline are listed.

Table A6.6. Overlap between SRs on breastfeeding or bottle feeding beyond 12 months and dental caries

Primary study (first author, year)[1]	Hooley (2012)	Tham (2015)	Overlap
Chaffee (2014)		X	2
Cogulu (2008)	X		1
Tada (1999)		X	1
Tanaka (2013)		X	2
Yonezu (2006)	X	X	2
Total	2	4	

[1] Only primary studies (RCTs or PCS) that include children aged 12 to 60 months at baseline are listed.

Table A6.7. Overlap between SRs on breastfeeding or bottle feeding beyond 12 months and malocclusion

Primary studies (first author, year)[1]	Hermont (2015)	Thomaz (2018)	Overlap
Caramez da Silva (2012)	X	X	2
Lescalo de Ferrer (2006)		X	1
Moimaz (2014)	X	X[2]	2
Warren and Bishara (2002)	X	X	2
Total	3	4	

[1] Only primary studies (RCTs or PCS) that include children aged 12 to 60 months at baseline are listed.
[2] Included in the SR but not MA by Thomaz et al (2018).

Annex 7: AMSTAR 2 assessment of identified systematic reviews

AMSTAR 2 tool

10. The AMSTAR 2 is a quality assessment tool of systematic reviews (SRs) with or without meta-analyses (MA) of randomised and non-randomised studies. It is composed of a checklist of 16 items or domains (Shea et al, 2017). For the majority of items, responses are dichotomous (‘yes’ or ‘no’). Five items also provide a ‘partial yes’ response.

11. The authors of AMSTAR 2 consider 7 of the 16 items to critically affect the validity of a SR and its conclusions. The critical domains suggested are items 2, 4, 7, 9, 11, 13, 15. The authors stress that this is advisory and that review appraisers should decide which items are most important for the SRs under consideration (Shea et al, 2017).

12. In the context of this risk assessment, item 2 (relating to protocol registration) and item 7 (relating to the list of excluded studies) were not considered as critical domains as registering the reviews and publishing the list of excluded studies are not standard practices in this area of work (the SRs identified for this risk assessment are mainly based on observational studies and tend to be more qualitative than quantitative).

13. The critical domains for this risk assessment were items 4, 9, 11, 13 and 15.

14. AMSTAR 2 is not intended to generate an overall score. However, the authors of AMSTAR 2 have proposed a scheme for interpreting weaknesses detected in critical and non-critical items or domains. The scheme is set out in Table A7.1.

Table A7.1 Rating overall confidence in the results of the SR

High	No or one non-critical weakness: the systematic review provides an accurate and comprehensive summary of the results of the available studies that address the question of interest.
Moderate	More than one non-critical weakness[1]: the systematic review has more than one weakness but no critical flaws. It may provide an accurate summary of the results of the available studies that were included in the review.
Low	One critical flaw with or without non-critical weaknesses: the review has a critical flaw and may not provide an accurate and comprehensive summary of the available studies that address the question of interest.
Critically low	More than one critical flaw with or without non-critical weaknesses: the review has more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies.

[1] Multiple non-critical weaknesses may diminish confidence in the review and it may be appropriate to move the overall appraisal down from moderate to low confidence.

AMSTAR 2 assessment of identified systematic reviews

1. The AMSTAR 2 assessments of SRs identified for this risk assessment are presented by chapter in tabulated form.
2. The critical domains have been highlighted in yellow in the tables.
3. N/A (non-applicable) is used for items 11, 12 and 15 for SRs without MAs.
4. Abbreviations used in the boxes below: DOI (declaration of interest), N/A (non-applicable), PICO (population, intervention, control or comparator, outcome(s)), RoB (risk of bias)

Energy and Macronutrients

Table A7.2. SRs on energy and macronutrients

Domains	Frantsve-Hawley et al (2017)	Hörnell et al (2013)	Luger et al (2017)	Naude et al (2018)	Parsons et al (1999)	Perez-Morales et al (2013)	Rouhani et al (2016)	Te Morenga et al (2012)	Voortman et al (2015a)	Voortman et al (2015b)
1. PICO	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Protocol	Partial yes	No	No	Yes	No	No	No	No	No	No
3. Study design	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4. Search strategy	Yes	Partial yes	Partial yes	Yes	Partial yes	Partial yes	Yes	Yes	Yes	Yes
5. Study selection duplication	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
6. Data extraction duplication	Yes	Yes	No	Yes	No	No	No	Yes	No	Yes
7. Excluded studies	Partial yes	Yes	No	Yes	No	No	No	Yes	No	No
8. Evidence tables	Yes	Yes	Yes	Yes	Partial yes	Yes	Yes	Yes	Yes	Yes
9. RoB tool	Yes	Yes	Partial yes	Yes	No	No	No	Partial yes	No	No
10. Funding of included studies	Yes	No	Yes	Yes	No	No	No	Yes	No	No

Domains	Frantsve-Hawley et al (2017)	Hörnell et al (2013)	Luger et al (2017)	Naude et al (2018)	Parsons et al (1999)	Perez-Morales et al (2013)	Rouhani et al (2016)	Te Morenga et al (2012)	Voortman et al (2015a)	Voortman et al (2015b)
11. Statistical analysis	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes	N/A	N/A
12. Impact RoB assessed	N/A	N/A	N/A	N/A	N/A	N/A	No	Yes	N/A	N/A
13. RoB discussed	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
14. Heterogeneity discussed	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
15. Publication bias	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes	N/A	N/A
16. DOI	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
OVERALL CONFIDENCE RATING	Moderate	Moderate	Low	High	Critically low	Critically low	Critically low	Moderate	Low	Low

Micronutrients

Table A7.3. SRs on micronutrients

Domains	Athe et al (2014)	Das et al (2013)	De-Regil et al (2011)	Domellöf et al (2013)	Eichler et al (2012)	Hojsak et al (2018)	Imdad et al (2017)	Matsuyama et al (2017)	Mayo-Wilson et al (2014)	Pasricha et al (2013)	Pratt (2015)	Ramakrishnan et al (2009)	Thompson et al (2013)
1. PICO	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Protocol	No	No	Yes	No	Partial yes	No	Yes	No	Yes	Partial yes	No	No	Partial yes
3. Study design	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4. Search strategy	Yes	Yes	Yes[1]	Yes	Yes	Partial yes	Yes	Yes	Yes	Yes	Partial yes	Yes	Yes
5. Study selection duplication	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes
6. Data extraction duplication	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes
7. Excluded studies	No	No	Yes	No	No	No	Yes	No	Yes	Yes	No	No	Yes
8. Evidence tables	Partial yes	Partial yes	Yes	Yes	Partial yes	Partial yes	Yes	Yes	Yes	Yes	Yes	Partial yes	Yes
9. RoB tool	Partial yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes
10. Funding of included studies	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No

Domains	Athe et al (2014)	Das et al (2013)	De-Regil et al (2011)	Domellöf et al (2013)	Eichler et al (2012)	Hojsak et al (2018)	Imdad et al (2017)	Matsuyama et al (2017)	Mayo-Wilson et al (2014)	Pasricha et al (2013)	Pratt (2015)	Ramakrishnan et al (2009)	Thompson et al (2013)
11. Statistical analysis	Yes	Yes	Yes	N/A	Yes	N/A	Yes	Yes	Yes	Yes	N/A	Yes	Yes
12. Impact RoB	No	No	Yes	N/A	Yes	N/A	Yes	Yes	No	Yes	N/A	No	No
13. RoB discussed	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No[2]	No	Yes
14. Heterogeneity discussed	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes
15. Publication bias	Yes	No	Yes	N/A	No	N/A	Yes	Yes	Yes	Yes	N/A	Yes	Yes[3]
16. DOI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OVERALL CONFIDENCE RATING	Low	Critically low	High	Low[4]	Low	Critically low	High	Moderate	Moderate	High	Critically low[4]	Critically low	Moderate

[1] Reference lists of included studies were not searched but the authors did search many databases (11 in total, including trials registries), contact authors, known experts and contacted organisations such as the World Health Organization, US Centers for Disease Control and Prevention, and UNICEF to identify unpublished studies.

[2] According to the AMSTAR criteria it should be a 'yes' as they included only studies at low risk of bias. However, it is not clear at all how they apply the CASP checklist and they do not specify which studies were excluded based on study quality criteria. The review team agreed in giving a 'no' to this question to highlight the lack of clarity and transparency.

[3] Thompson et al (2013) conducted an extensive literature search of 6 databases and also searched the WHO regional databases. They commented that there was only a limited number of studies that were conducted mainly in LMIC and that therefore their findings were only relevant to these countries.

[4] Downgraded due to the high number of non-critical weaknesses.

Foods, dietary components, and dietary patterns

Table A7.4. SRs on foods

Domains	de Beer (2012)	Delgado and Matijasevich (2013)	Dougkas et al (2019)	Dror and Allen (2014)	Ledoux et al (2011)
1. PICO	Yes	Yes	Yes	Yes	Yes
2. Protocol	No	No	No	No	No
3. Study design	N/A	N/A	N/A	N/A	N/A
4. Search strategy	No	Partial yes	Yes	Yes	Yes
5. Study selection duplication	No	No	No	No	No
6. Data extraction duplication	No	No	No	No	No
7. Excluded studies	No	No	No	No	No
8. Evidence tables	Partial yes	Partial yes	Partial yes	Partial yes	Partial yes
9. RoB tool	Partial yes	No	No	No	No
10. Funding of included studies	No	No	Yes	No	No
11. Statistical analysis	No	No	N/A	N/A	N/A
12. Impact RoB assessed	Yes	No	N/A	N/A	N/A
13. RoB discussed	No	No	Yes	No	No
14. Heterogeneity discussed	Yes	Yes	Yes	Yes	Yes
15. Publication bias	Yes	No	N/A	N/A	N/A
16. DOI	No	No	Yes	Yes	Yes
OVERALL CONFIDENCE RATING	Critically low	Critically low	Low	Critically low	Critically low

Table A7.5. SRs on dietary patterns

Domains	Costa et al (2018)	Tandon et al (2016)
1. PICO	Yes	Yes
2. Protocol	No	Partial yes
3. Study design	N/A	N/A
4. Search strategy	Yes	Partial yes
5. Study selection duplicate	Yes	Yes
6. Data extraction duplicate	No	No
7. Excluded studies	No	No
8. Evidence tables	Partial yes	Partial yes
9. RoB tool	Partial yes	No
10. Funding of included studies	No	No
11. Statistical analysis	N/A	N/A
12. Impact RoB assessed	N/A	N/A
13. RoB discussed	Yes	No
14. Heterogeneity discussed	No	Yes
15. Publication bias	N/A	N/A
16. DOI	Yes	No
OVERALL CONFIDENCE RATING	Moderate	Critically low

Table A7.6. SRs on dietary (non-nutrient components)

Domains	Karalexi et al (2018)	Onubi et al (2015)
1. PICO	Yes	Yes
2. Protocol	No	No
3. Study design	N/A	N/A
4. Search strategy	No	Partial yes
5. Study selection duplicate	Yes	Yes
6. Data extraction duplicate	Yes	Yes
7. Excluded studies	No	No
8. Evidence tables	Partial yes	Yes
9. RoB tool	Partial yes	Yes
10. Funding of included studies	No	No
11. Statistical analysis	No	N/A
12. Impact RoB assessed	Yes	N/A
13. RoB discussed	Yes	No
14. Heterogeneity discussed	Yes	Yes
15. Publication bias	Yes	N/A
16. DOI	Yes	Yes
OVERALL CONFIDENCE RATING	Critically low	Low

Eating and feeding behaviours

Table A7.7. SRs on eating and feeding behaviours

Domains	Appleton et al (2018a)	Bergmeier et al (2015)	Blondin et al (2016)	Brown et al (2016)	Caleza et al (2016)	Hodder et al (2018)	Hurley et al (2011)	Mikkelsen et al (2014)	Mura Paroche et al (2017)	Nekitsing et al (2018)	Osei-Assibey et al (2012)	Russell et al (2016)	Ward et al (2015)
1. PICO	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Protocol	Yes	No	No	Yes	No	Yes	No	No	No	Partial yes	No	Partial yes	Partial yes
3. Study design	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4. Search strategy	Yes	Yes	No	Partial yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Study selection duplication	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes
6. Data extraction duplication	Yes	No	No	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes
7. Excluded studies	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No
8. Evidence tables	Yes	Partial yes	Partial yes	Partial yes	Partial yes	Yes	Partial yes	Partial yes	Yes	Yes	Partial yes	Partial yes	Partial yes
9. RoB tool	Partial yes	No	No	Yes	Partial yes	Yes	No	Yes	No	Partial yes	Yes	Partial yes	Partial yes
10. Funding of included studies	No	No	No	No	No	Yes	No	No	No	No	No	No	No

11. Statistical analysis	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A	No	N/A	N/A	N/A
12. Impact RoB assessed	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A	Yes	Yes	N/A	N/A	N/A
13. RoB discussed	Yes	No	Yes	Yes	No	Yes	No	No	No	Yes	No	Yes	Yes
14. Heterogeneity discussed	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
15. Publication bias	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
16. DOI	Yes	Yes	No	Yes	Yes	Yes	No	Yes	N/A	Yes	Yes	Yes	Yes
OVERALL CONFIDENCE RATING	Moderate	Critically low	Critically low	Moderate	Critically low	High	Critically low	Low	Critically low	Low	Low	Moderate	Moderate

Excess weight and obesity

Table A7.8. SRs on excess weight and obesity

Domains	Brisbois et al (2012)	Llewellyn et al (2016a)
1. PICO	Yes	Yes
2. Protocol	No	Partial yes
3. Study design	N/A	N/A
4. Search strategy	Yes	Yes
5. Study selection duplication	Yes	Yes
6. Data extraction duplication	Yes	Yes
7. Excluded studies	No	No
8. Evidence tables	Partial yes	Partial yes
9. RoB tool	No	Yes
10. Funding of included studies	Yes	No
11. Statistical analysis	N/A	No
12. Impact RoB assessed	N/A	No
13. RoB discussed	No	No
14. Heterogeneity discussed	No	Yes
15. Publication bias	N/A	No
16. DOI	Yes	Yes
OVERALL CONFIDENCE RATING	Critically low	Critically low

Oral health

Table A7.9. SRs on oral health

Domains	Baghlaf et al (2018)	Hermont et al (2015)	Hooley et al (2012a)	Hooley et al (2012b)	Moynihan and Kelly (2014)	Tham et al (2015)	Thomaz et al (2018)
1. PICO	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Protocol	Yes	No	No	Partial yes	Yes	No	No
3. Study design	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4. Search strategy	Yes	Yes	Yes	No	Yes	Yes	Yes
5. Study selection duplication	Yes	Yes	No	Yes	Yes	Yes	Yes
6. Data extraction duplication	Yes	Yes	No	Yes	Yes	No	Yes
7. Excluded studies	Yes	Yes	Yes	Yes	Yes	No	No
8. Evidence tables	Yes	Partial yes	Yes	Yes	Yes	Yes	Partial yes
9. RoB tool	Partial yes	Partial yes	Partial yes	Partial yes	Partial yes	Yes	Yes
10. Funding of included studies	Yes	No	No	No	Yes	No	No
11. Statistical analysis	N/A	N/A	N/A	N/A	N/A	No	Yes
12. Impact RoB assessed	N/A	N/A	N/A	N/A	N/A	No	Yes
13. RoB discussed	Yes	Yes	Yes	No	Yes	Yes	Yes
14. Heterogeneity discussed	Yes	Yes	Yes	No	Yes	Yes	Yes
15. Publication bias	N/A	N/A	N/A	N/A	N/A	Yes	Yes
16. DOI	Yes	Yes	Yes	No	Yes	Yes	Yes
OVERALL CONFIDENCE RATING	High	Moderate	Low[1]	Critically low	High	Low	Moderate

[1] Downgraded due to the high number of non-critical weaknesses

Annex 8: Extracted data from primary studies included in the systematic reviews

Energy

Table A8.1 Dietary energy

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Effect of portion sizes on child food intake										
	Ward et al (2015) AMSTAR 2 confidence rating: moderate									
Effect of self-selection (compared to restrictive feeding) and food intake	Pre-post study (Branen and Fletcher, 1994) (40) USA	Age 3 to 4 years	54-day period	Children either given 1 standard portion of a snack (for 29 days)* vs allowed to self-select the amount (for another 25 days)*	Child food intake at snack time	Children increased their intake of snacks when teachers allowed children to self-select compared with when they pre-portioned food	NR	See 'Measure of association or effect'	NR	School setting

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						Self-selection vs pre-portioning (a) portions of snack eaten: MD 0.87 (p<0.01) (b) portions of snacks wasted: MD 0.03 (p≥0.05) (c) grams of snacks wasted: MD 2.7 (p≥0.05)				
	Mikkelsen et al (2014) AMSTAR 2 confidence rating: low									

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Portion sizes and food intake	Quasi-experimental study (Ramsey et al, 2013) (235) USA	2 to 7 years	5 days	Children served a portion size of 4 chicken nuggets during school lunch (standard amount) or given the choice to self-select smaller portion sizes of 2, 3 and 4 nuggets.	Food intake (measured by plate waste)	Children's intake of chicken nuggets was greater when they were not given a choice of nugget portion size. This demonstrates that serving larger portion sizes in preschools increase children's intake.	NR	NR	NR	Quantitative data not reported by SR Intake measured at school canteen not individual level

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Portion sizes and food intake	Quasi-experimental study (Leahy et al, 2008) (77) USA	2 to 5 years	6 weeks (1 day per week)	Children were served two versions of a macaroni and cheese dish with the same palatability; one was energy dense and the other a calorie-reduced version. Each version was served 3 times. Other foods served during lunch were 2% milk, steamed	Children: preference assessment of the two dishes Height and weight. Lunch intake of the two different dishes. Parents: Child feeding questionnaire Socio-demographic variables.	Decreasing the energy density of the macaroni and cheese by 30% significantly decreased children's energy intake from the dish by 25% and total lunch energy intake by 18%. Children consumed significantly more of the lower-energy-dense version.	NR	NR	NR	Within-subject crossover*

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				broccoli and unsweetened applesauce.* All lunch times were consumed ad libitum.*						
	Osei-Assibey et al (2012) AMSTAR 2 confidence rating: low									
Portion sizes and food intake	Within-subject crossover design (Fisher et al, 2003) (35) USA	2 to 5 years	3 months	Exposure to large portion of an entrée (macaroni and cheese*) – main component of the lunch meal* Other foods served (the standard lunch menu) were milk, applesauce, carrots,	Food intake (and weight status)	Doubling an age-appropriate portion of the entrée increased the amount of entrée eaten (g) by 25% (± SEM 7%) (p<0.001) and total energy intake by 15% (± SEM 5%)	NR	See 'Measure of association or effect'	NR	Preschool setting

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				sugar cookies*		(p<0.01) at lunch				
Portion sizes and food intake	Non-randomised controlled trial (Rolls et al, 2000) (32) USA	3 to 6 years Younger children (mean age 3.6 years) analysed separately from older children (mean age 5.0 years)*	3 lunch sessions, once a week for 3 weeks*	Children offered portions of lunch foods that were larger than, smaller than, or about equal to the USDA recommended serving sizes*	Food intake (kcal, grams)*	Children aged 4.3–6.1 years (mean age 5.0 years) had higher total energy intake when served larger portions (p<0.002) but this effect was not seen in children aged 3.0–4.3 years (mean age 3.6 years) No results reported on	NR	See ‘Measure of association or effect’	NR	Preschool setting

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						food intake in grams				
Portion sizes and food intake	Within-subject crossover design (Looney et al 2011) (17) USA	3 to 5 years	4 sessions* across 2 months	Sessions 1 and 2: children received higher-energy-dense snack (small then large portion)* Sessions 3 and 4: children received the lower-energy dense snack (small then large portion)*	Food intake (kcal, grams*)	There was a significant impact of portion size on snack intake (small portion size 84.2 ±30.8 kcal, large portion size 99.0 ±52.5 kcal; p<0.05) Results on impact of portion size on snack intake (g) was not reported	NR	See 'Measure of association or effect'	NR	Pre-school setting Unclear whether the measure of uncertainty is SD or SE
Dietary energy intake and BMI										
	Rouhani et al (2016) AMSTAR 2 confidence rating: critically low									

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Energy dense foods and BMI	PCS (Durao et al, 2014) (589) Portugal	2 years*	Age 4 years *	Consumption of energy dense foods (EDF) (average daily frequencies of consumption)* FFQ questionnaire completed at interview with primary caregiver EDF included carbonated SSBs, non-carbonated SSBs, crisps, pizza, hamburgers, cakes, chocolate, sweets	BMI z-score	No association between consumption of EDF at age 2 years and BMI z-score at age 4 years	NR	NS (p-value NR)	Child's exact age in months at 2 years, maternal characteristics (education, age, pre-pregnancy BMI)	None

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Parsons et al (1999) AMSTAR 2 confidence rating: critically low									
Energy intake and BMI	PCS (Deheeger et al, 1996) (112) France	10m, 2, 4, 6, 8 years	Age 8 years	Energy intake (kcal) Dietary history collected in an interview with mothers of the children*	BMI Height and weight obtained from medical files for first 3 ages (10m to 4 years); then measured at home at ages 6 and 8 years	Increase in energy intake (per day*) between the ages 4 to 6 years was greatest in children in the highest tertile of BMI at age 8 years compared with groups who were in the middle or lowest tertile of BMI; the increase in energy intakes before age 4 years and after age 6	NR	0.01	None*	Analyses on same cohort as Rolland-Cachera (1995) 60% drop out

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						were not predictive of BMI tertile at age 8				
Energy intake and BMI	PCS (Griffiths et al, 1990) (37) UK	3 to 4 years	Age 15 years	Energy intake per kg of body weight Dietary assessment method NR	BMI Assessment of height and weight NR	Correlation coefficient -0.73 In girls only (n=10) No association in boys (data NR)	NR	<0.0118	None*	None
Energy intake and BMI	PCS (Klesges et al 1995) (146) USA	3 to 5 years	2 years	Energy intake (kcal) Willett FFQ for children*	Change in BMI Height and weight measured by trained research assistants*	NR	NR	NS (p-value NR)	Sex, age, baseline BMI, family risk (parental weight status), baseline % intake of carbohydrate and	No power calculation *

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									dietary fat, change in intakes from baseline to follow-up (1 y and 2 y), physical activity*	
Energy intake and BMI	PCS (Rolland - Cachera et al, 1995) (112) France	2 years	8 years	Energy intake (kcal) Interviews conducted by dietitian to assess diet history – a typical day's eating pattern*	BMI	(1) Energy intake at 2 years correlated with BMI at 8 years (r=0.20) (2) After adjustment for SES, energy intake remained correlated with BMI (r=0.20)*	NR	(1) 0.049 (2) 0.044*	SES	Analyses on same cohort as Deheeger et al 1996 60% drop out

Exposure and outcome	Study type (n participants) Country	Base-line age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Energy intake and body fat										
	Dougkas et al (2019) AMSTAR 2 confidence rating: low									
Energy intake (from milk) and body fat	PCS (Kral et al 2008) (49) USA	3 to 5 years	3 years	Energy intake from milk (change in calories consumed at ages 3 to 5 years)	Waist circumference (cm)	Increase in calories consumed from milk was associated with 0.01 (SE 0.004) decrease in waist circumference	NR	0.04	Change in waist circumference from ages 3 to 5 years and total energy intake at 3 years	None
	Parsons et al (1999) AMSTAR 2 confidence rating: critically low									
Energy intake and body fat	PCS (Griffiths et al, 1990) (37) UK	3 to 4 years	Age 15 years	Energy intake per kg of body weight	Body fat mass index (BFMI) (fat mass or height^2)	Correlation coefficient -0.77 In girls only (n=10) No association in boys (data NR)	NR	<0.009	None*	None

Table A8.2 Carbohydrate intake and obesity outcomes

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Carbohydrate (CHO) intake and BMI										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
CHO intake and BMI	PCS (Skinner et al 2004) (70) USA	2 to 8 years	Age 8 years	Total CHO (% energy) 24h recalls age 20 months and earlier; 3 day records (2 food records and 1 24 hour recall) at age 2 to 3 years	BMI Measurements by dietician*	Mean CHO intake from age 2 to 8 years (longitudinal intake) associated with lower BMI at 8 years	NR	NR	Sex, baseline BMI, birthweight, age at adiposity rebound, age at cereal introduction, breastfeeding duration	None

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									, dietary variety, sedentary activity, mother's perception of child as picky eater at age 6, parental BMI*	
	Parsons et al (1999) AMSTAR 2 confidence rating: critically low									
CHO intake and BMI	PCS (Klesges et al 1995) (146) USA	3 to 5 years	2 years	Total CHO intake (% energy) Willett FFQ for children*	Change in BMI Measurements by trained research assistants*	NR	NR	NS (p-value NR)	Sex, age, baseline BMI, family risk (parental weight	None

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									status), baseline energy intake, % intake of carbohydrate and dietary fat, change in intake from baseline to follow-up (1 year and 2 year), physical activity*	

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
CHO intake and BMI	PCS (Rolland-Cachera et al, 1995) (112)	2 years	Age 8 years	Total CHO intake (% energy) Interview survey of diet history*	BMI Objectivity of assessment NR*	r=-0.07*	NR	0.5*	Baseline BMI, energy intake, parental BMI, SES*	60% drop out
CHO intake and body fat										
	Parsons et al (1999) AMSTAR 2 confidence rating: critically low									
CHO intake and body fat	PCS (Rolland-Cachera et al, 1995) (112)	2 years	Age 8 years	Total CHO intake (% energy)	Triceps skinfold Subscapular skinfold	No association (data NR)	NR	NR	Baseline BMI, energy intake, parental BMI, SES	60% drop out
Sugars-sweetened beverages (SSBs) and BMI or body weight										
	Te Morenga et al (2012) AMSTAR 2 confidence rating: moderate									

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
SSBs and odds of overweight	MA of 7 estimates from 5 PCS (7255)	Mostly under age 5 years – Findings in children aged 1 to 5 , 85% weighting in MA	1 to 8 years later	SSB consumption (servings per day or per week)	BMI	OR 1.55	1.32 to 1.82	<0.001	Total energy intake (4 of 5 studies or 6 of 7 comparisons) adjusted for baseline BMI Other confounders adjusted for by most studies: age, sex, dietary intake,	Random-effects model I^2=0

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									physical activity	
	Frantsve-Hawley et al (2017) AMSTAR 2 confidence rating: moderate									
SSBs and odds of overweight	PCS (De Coen, 2014) (568) Belgium	3 to 6 years	18 and 30 months	SSB consumption (ml per day) Validated semi-quantitative FFQ*	BMI z-score Measurements performed by research team*	Odds of overweight (after 30 months*) for children who consumed >65ml per day* SSB OR 1.36 To note that 65ml per day	0.77 to 2.40	NR	Baseline BMI, child consumption of water, milk products, vegetables and fruit, sweet and savoury snacks, physical activity,	None

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						was the mean intake level in the study sample*			screen time, parental education and professional status, parental weight status, number of children in household	
SSBs and risk of overweight	PCS (Wheaton, 2015) (4169) Australia	4 to 5 years	6 years	SSB consumption vs no consumption	BMI z-score	RR for normal weight becoming overweight with	NR	0.57	Baseline BMI, age, sex, ethnicity, SES, parental	Data from cohort re-analysed by Millar et al (2014)

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						SSB consumption vs no consumption = 0.97 (SE 0.05)			BMI, intakes of vegetables and fruit, and high-fat foods, sedentary behaviours (TV and computer use)	
	Frantsve-Hawley et al (2017) AMSTAR 2 confidence rating: moderate									
SSB and change in BMI z-score	PCS (De Boer, 2013) (9600) USA	2 years	Age 4 years	1 SSB per day vs <1 per day* Data collected by trained assessor	BMI z-score Measurements performed by trained assessors*	Greater increase in BMI z-score (from age 2 to 4	NR	<0.05	Sex, ethnicity, SES	ECLS-B cohort

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				during interview*		years*) in children consuming 1 SCB per day vs <1 SCB per day at age 2 (data NR)				
SSBs and change in BMI	PCS (Guerrero, 2016) (15,418) USA	48 months (4 years)	2 years	Consumption of any versus no SSBs Data collected via parent interviews*	BMI Measurements followed standard protocols for the ECLS-B cohort*	Change in BMI from age 4 to 6 years with any vs no SSB intake: 0.138 (SE 0.037)	NR	<0.01	Age, sex, ethnicity, birthweight, number of parents in household,	ECLS-B cohort*

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									poverty status, maternal education, breastfeeding, consumption of fast food, fruits and vegetables	
SSB and BMI z-score	PCS (Kuhl, 2014) (36) USA	2 to 5 years	6 months	SSB consumption	BMI z-score	Unit increase in SSB consumption associated with 0.191	-0.011 to 0.040	NR	Total energy intake, intake of fruits and vegetables,	None

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						BMI z-score			sweet and salty drinks, physical activity and screen time	
SSBs and change in BMI	PCS (Millar, 2014) (4169) Australia	4 to 5 years	6 years	SSB consumption per day	BMI z-score	Change in BMI with each additional intake of SSB per day: 0.015	0.004 to 0.025	<0.01	Sex, dietary fat intake, household income, maternal BMI	Data from cohort re-analysed by Wheaton et al (2015)
SSBs and change in BMI	PCS (Newby, 2004) (1345) USA	2 to 5 years	6 months	SSB consumption (ounce per day)	BMI Measurements performed by trained staff	Each additional ounce per day of SSB associat	NR	0.34	Baseline BMI, age, sex, SES, materna	Adjusting for energy intake did not substantially change the

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				FFQ for the previous month		ed with -0.02 (SE 0.02) change in BMI			l education, birth weight	results (-0.01; SE = 0.02; p=0.50)
	Luger et al (2017) AMSTAR 2 confidence rating: low									
SSBs X BMI	PCS (Cantoral et al, 2015) (227) Mexico	1 year	13 years	SSB consumption (units NR)	BMI (odds of obesity*)	Association between SSB consumption and BMI (data NR)	NR	NR	Sex, age, breastfeeding duration, non-SSB energy intake, maternal obesity at 12m post-partum, physical activity, TV	None

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									watching*	
SSBs and change in weight-for-height z-score (WHZ)	PCS (Chaidez et al, 2014) (67) USA	2.3 years	6 months	SSB consumption (units NR)	Change in WHZ*	Association between SSB consumption and WHZ (data NR)	NR	NR	Sex, birth weight, baseline WHZ, intake of foods high in dietary fat and sugar, parenting styles, maternal education and income*	Sample in Hispanic children

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
SSBs and body fat										
	Perez-Morales et al (2013) AMSTAR 2 confidence rating: critically low									
SSBs and body fat	PCS (Kral et al, 2008) (135) USA	3 to 5 years	3 years	Sweetened milk, fruit drinks, caloric and non-caloric soda, soft drinks (units NR)	Waist circumference (cm)	A greater increase in soda consumption over time was associated with greater child WC (beta coefficient 0.04)	NR	0.0001	Change in BMIz from age 3 to 5 years, total energy intake at 3 years*	Sample in white children

Table A8.3 Carbohydrate intake and other health outcomes

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Tandon et al (2016) AMSTAR 2 confidence rating: critically low									
SSBs and cognitive development	PCS (Nyaradi et al 2013) (1455) Australia	1, 2, 3 years	Age 10 years	SSB consumption (as part of a diet score)	(1) Verbal ability (Peabody Picture Vocabulary Test III) (2) Non-verbal reasoning (Raven's Coloured Progressive Matrices)	(1) NR (2) Higher intake of SSB at age 1 associated with lower non-verbal reasoning ability at age 10	NR	NR	Sex, breastfeeding duration, maternal characteristics (age, education, mental health distress), family income, father living with family, reading to the child	No information on ethnicity

Table A8.4 Dietary fat intake and obesity outcomes

Exposure and outcome	Study type (n participants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total fat intake and body weight										
	Naude et al (2018) AMSTAR 2 confidence rating: low									
Total fat and change in body weight (1 to 2 years later)	PCS (Niinikoski et al 1997) (740) Finland	7 to 36 months	1.5 and 2 years	Low fat (LF) group (27.7 to 28.7% energy) vs high fat (HF) group (>28.7% energy) 4-day dietary	Change in body weight	No difference in weight gain from age 7 months to 36 months (no effect size)	NR	0.81	None	Convenience sample, sample size justification accurately described Significant imbalance in participant numbers between groups LF: n=35; HF: n=705

Exposure and outcome	Study type (n participants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total fat and change in body weight (2 years later)	PCS (Shea et al 1993) (215) USA (predominantly Hispanic population)	3 to 4 years	2 years (mean)	LF (≤30% energy) HF (>30% energy) 4 x 24h dietary recall 3 x semi-quantitative FFQs at baseline – averaged to a single estimate of nutrient intake	Change in body weight (kg per year) Height and weight measured by balance scale and stadiometer *	MD 0.2kg per year	-0.26 to 0.66	NR	Unadjusted results presented in Naude as adjusted results (for sex, ethnicity, baseline body weight, total energy intake) didn't alter results	Convenience sample No sample size justification
Total fat intake and BMI										
	Naude et al (2018) AMSTAR 2 confidence rating: low									
Total fat and change in BMI (2 years later)	PCS (Klesges et al 1995) (146) USA	3 to 5 years	2 years	Total fat intake (% energy) Willett FFQ for children	Change in BMI Height and weight measured by trained research assistants*	Beta coefficient 0.034kg/m^2 for every 1% increase in energy from dietary fat	NR	0.05	Sex, age, baseline BMI, baseline energy intake, parental BMI, physical activity	Convenience sample No sample size justification

Exposure and outcome	Study type (n participants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total fat and change in BMI (2 years later)	PCS (Shea et al 1993) (215) USA (predominantly Hispanic population)	3 to 4 years	2 years (mean)	LF (≤30% energy) HF (>30% energy) 4 x 24h dietary recall 3 x semi-quantitative FFQs (Willett FFQ) at baseline – averaged to a single estimate of nutrient intake	Change in BMI (kg/m^2 per year) Height and weight measured by balance scale and stadiometer *	MD 0.02kg/m^2 per year between LF vs HF	-0.26 to 0.30	>0.05	Unadjusted results reported in Naude as adjusted results (for sex, ethnicity, baseline BMI, total energy intake) didn't alter results	Convenience sample No sample size justification
Total fat and change in BMI (3 years later)	PCS (Jago et al 2005) (133) USA	3 to 4 years	3 years	Total fat intake (% energy) 4 day observed dietary intake –recorded by trained observers	Change in BMI Height and weight measured by stadiometer and balance-beam scale*	Dietary factors were not associated with BMI across the 3 study years	NR	NR	Sex, ethnicity, baseline BMI, parental overweight, sedentary behaviour, physical activity, dietary behaviours, total energy intake	Convenience sample No sample size justification

Exposure and outcome	Study type (n participants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total fat and change in BMI (6 years later)	PCS (Skinner et al 2004) (70) USA	2 to 8 years	Age 8 years	Total fat intake (g) Interviews conducted by 2 dieticians: 24 hour dietary recall and 2-day food records (dietary assessment included 3 non-consecutive days) at 9 time points. Intakes from each time point averaged to provide 9 daily intakes	Change in BMI Assessed by dietician (weight, standard scale; height, steel tape)*	Beta coefficient 0.01kg/m^2 for every 1g increase in total fat intake	NR	0.0039	Baseline BMI, birthweight, age at cereal introduction, breastfeeding duration, dietary variety, sedentary activity	Purposely selected sample from 2 metropolitan areas No sample size justification
Total fat and change in BMI z-score (14	PCS (Alexy et al 2004) (112) Germany	3.2 years	Age 17 years	LF (32% energy) HF (40% energy)	Change in BMI z-score Accuracy of assessment NR	BMI z-score decreased by 0.13 BMI z-score in	NR	NR	None	Convenient sample No sample size justification

Exposure and outcome	Study type (n participants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
years later)				3-day weighed dietary record		the LF group while BMI z-score increased by 0.04 in the HF group				
	Parsons et al (1999) AMSTAR 2 confidence rating: critically low									
Total fat and BMI (6 years later)	PCS (Rolland-Cachera et al, 1995) (112)	2 years	6 years	Total fat intake (% energy) Dietician conducted interview of diet history – a typical day's eating pattern*	BMI Accuracy of assessment NR	Correlation coefficient 0.02*	NR	0.77*	Baseline BMI, energy intake, parental BMI, SES	60% drop out
Total fat intake and body fat										
	Naude et al (2018) AMSTAR 2 confidence rating: low									
Total fat and body fat	PCS (Skinner et al 2004) (53) USA	2 years	4 years	Total fat intake (g per day)	(1) % body fat (2) body fat (g)	(1) For every 1 unit increase in total fat	NR	(1) 0.02	Baseline BMI, parental BMI, sex, dietary variables (protein,	No sample size justification Data from Carruth

Exposure and outcome	Study type (n participants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						intake, body fat increases by 0.619% (SE 0.261%) (2) For every 1 unit increase in fat intake, body fat increases by 179g (SE 70.1)		(2) 0.01	monounsaturated fat intakes g per day; calcium mg per day)	and Skinner, 2001*
	Parsons et al (1999) AMSTAR 2 confidence rating: critically low									
Total fat and body fat	PCS (Rolland-Cachera et al, 1995) (112) France	2 years	Age 8 years	Total fat intake (% energy)	Body fat (1) subscapular skinfold (2) triceps skinfold	Correlation coefficient: (1) 0.02* (2) -0.05*	NR	(1) 0.79* (2) 0.65*	Baseline BMI, energy intake, parental BMI, SES*	60% drop out
Polyunsaturated fatty acids (PUFA) intake and BMI										
	Voortman et al (2015) AMSTAR 2 confidence rating: low									

Exposure and outcome	Study type (n participants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
PUFA and odds of overweight	PCS (Heppe et al 2013) (3610) Netherlands	14 months	Age 4 years	PUFA intake (energy-adjusted g per day)	BMI	OR of preschool overweight (undefined)* 0.77	0.62 to 0.96	<0.05	Sex, birth weight, age of introduction to solid foods, intakes of SFA and MUFA (units unclear), parental BMI, maternal smoking, SES*	None
PUFA and BMI cut-off	PCS (Scaglioni et al 2000) (147) Italy	1 year	Age 5 years	PUFA intake (% energy)	BMI A child was defined to be overweight if their BMI was over the 90th centile of the age and sex-adjusted Rolland-Cachera curves.	No difference in intakes at age 1 year between children ≤90th BMI centile vs >90th BMI centile at age 5 years*	NR	0.60	None (results cited in Voortman were not adjusted, even though the study did perform multiple regression analyses)	None
PUFA intake and body fat										
	Voortman et al (2015) AMSTAR 2 confidence rating: low									

Exposure and outcome	Study type (n participants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
PUFA and body fat	PCS (Carruth and Skinner, 2001) (53) USA	2 to 5 years	Age 5.8 years	PUFA intake (g per day)	% body fat	NR	NR	NS (p-value NR)	Sex, BMI (age unspecified), dietary variables (including longitudinal daily intakes of protein and micronutrient intake – units unclear), parental BMI	None
n3-PUFA intake and BMI										
	Voortman et al (2015) AMSTAR 2 confidence rating: low									
n-3 PUFA and BMI z-score	RCT (Andersen et al 2011) (133) Denmark	9 to 18 months	9 months	DHA + EPA supplementation (1.6g fish oil) versus control (sunflower oil)	BMI z-score	No effect (effect size NR)	NR	0.85	N/A	None
n-3 PUFA and BMI	RCT (Ayer et al 2009) (100) Australia	6 months to 5 years	Age 8 years	Rapeseed and fish oil supplementation (500mg) vs control	BMI	No effect (effect size NR)	NR	NS (p-value NR)	N/A	None

Exposure and outcome	Study type (n participants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				(sunflower oil)						
n-3 PUFA and BMI z-score	PCS (Standl et al 2014) (388) Germany	2 years	Age 6 and 10 years	Plasma phospholipids	BMI z-score	No association	NR	NR	Birthweight, breastfeeding duration, maternal BMI	None

Table A8.5 Dietary fat intake and blood lipids

Exposure X outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
PUFA intake and total cholesterol (TC)										
	Voortman et al (2015) AMSTAR 2 confidence rating: low									
PUFA and TC	PCS (Ohlund et al 2008, 2011) (127) Sweden	6 months to 4 years	Age 4 years	PUFA (% energy)	TC (adjusted for gender)	NR	NR	NS (p-value NR) in univariate analysis	N/A	None
PUFA and TC	PCS (Cowin et al 2001) (496) UK	18 months	Age 31 months	Energy-adjusted PUFA (g per day) Natural log of PUFA intake entered into models	TC	NR	NR	NS (p-value NR)	Sex, ethnicity, energy intake, energy-adjusted intake of saturated fat and PUFA, starch, sugar, dietary fibre (NSP) and vitamin C*	None
PUFA intake and low density lipoprotein cholesterol (LDL-C)										

PUFA and LDL-C	PCS (Ohlund et al 2008, 2011) (127) Sweden	6 months to 4 years	Age 4 years	PUFA (% energy)	LDL-C (adjusted for gender)	NR	NR	NS (p-value NR)	N/A	
PUFA intake and high density lipoprotein cholesterol (HDL-C)										
PUFA and HDL-C	PCS (Cowin et al 2001) (496) UK	18 months	Age 31 months	Energy-adjusted PUFA (g per day) Natural log of PUFA intake entered into models	HDL-C	NR for all outcomes except for HDL-C. For every unit increase in the natural log of PUFA intake, there is a 0.15 decrease in HDL-C in girls only	-0.29 to -0.01	0.036	Sex, ethnicity, energy-adjusted intake of saturated fat and PUFA, starch, sugar, dietary fibre (NSP) and vitamin C*	None
PUFA and HDL-C	PCS (Ohlund et al 2008, 2011) (127) Sweden	6 months to 4 years	Age 4 years	PUFA (% energy)	HDL-C (adjusted for gender)	NR	NR	NS (p-value NR)	N/A	None

n-3 PUFA intake and HDL-C										
n-3 PUFA and HDL-C	RCT (Ayer et al 2009) (100) Australia	6 months to 5 years	Age 8 years	Fish oil supplementation vs placebo (NR)	HDL-C	No effect (effect size NR)	NR	NS (p-value NR)	N/A	None
n-3 PUFA intake and triacylglycerol (TG)										
PUFA and TG	RCT (Ayer et al 2009) (100) Australia	6 months to 5 years	Age 8 years	Fish oil supplementation vs placebo (NR)	TG	No effect (effect size NR)	NR	NS (p-value NR)	N/A	None

Table A8.6 Dietary fat intake and blood pressure

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
PUFA intake and blood pressure										
	Voortman et al (2015) AMSTAR 2 confidence rating: low									
PUFA and systolic blood pressure (SBP)	PCS (van den Hooven, 2013) (2882) Netherlands	14 months	Age 6 years	PUFA (g per day)	SBP (mm Hg)	Beta coefficient 0.26 Highest tertile of intake (>8.6g per day)* vs lowest tertile of intake (<7.0g per day)*	-0.41 to 0.93	NS (p-value NR)	Sex, ethnicity, birth weight, BMI at age 6, energy intake, macronutrient intake, sedentary behaviour, maternal smoking and educational level	None
PUFA and diastolic blood pressure (DBP)	PCS (van den Hooven, 2013) (2882) Netherlands	14 months	Age 6 years	PUFA (g per day)	DBP (mm Hg)	Beta coefficient 0.10 Highest tertile of intake (>8.6g per day)* vs lowest	-0.46 to 0.66	NS (p-value NR)	Sex, ethnicity, birth weight, energy intake, macronutrient intake, sedentary behaviour, maternal smoking and	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						tertile of intake (<7.0g per day)*			educational level	
n-3 PUFA intake and blood pressure										
n-3 PUFA and SBP	RCT (Ayer et al 2009) (100) Australia	6 months to 5 years	Age 8 years	Rapeseed and fish oil supplementation (500mg) vs control (sunflower oil)	SBP (mm Hg)	No effect (effect size NR)	NR	0.66	N/A	None
n-3 PUFA and DBP	RCT (Ayer et al 2009) (100) Australia	6 months to 5 years	Age 8 years	Rapeseed and fish oil supplementation (500mg) vs control (sunflower oil)	DBP (mm Hg)	No effect (effect size NR)	NR	0.93	N/A	None

Table A8.7 Dietary fat intake and linear growth

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total fat intake and age at peak growth										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
Total fat and age at peak growth velocity (PGV)	PCS (Berkey et al 2000) (67 girls) USA	1 to 2 years	Age 6 to 8 years	Total fat (g per day) age and energy-adjusted, expressed as log residuals entered into models*	PGV	For every 1 SD increase in total fat intake, age at peak growth was reduced by 0.63 years	NR	<0.05 *	Baseline height and BMI, age-adjusted total energy intake at age 1 to 2, and age or energy-adjusted intakes of vegetable protein and total fat (g per day)*	Study conducted in the women born in the 1930s-1940s High drop-out rate (43%)
Total fat intake and height										
	Naude et al (2018) AMSTAR 2 confidence rating: low									

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total fat and height	PCS (Niinikoski et al 1997) (740) Finland	7 to 36 months	1.5 and 2 years	Low fat (LF) group (27.7 to 28.7% energy) vs high fat (HF) group (>28.7% energy)	Change in height (%)	At 1 year: LF = 0.18 (1.0)% ; HF = 0.16 (0.9)%	NR	0.93	None	Significant imbalance in participant numbers between groups LF: n=35; HF: n=705
Total fat and height	PCS (Shea et al 1993) (215) USA (predominantly Hispanic population)	3 to 4 years	2 years (mean)	LF (≤30% energy) HF (>30% energy)	Change in height (cm per year)	MD 0.2	-0.24 to 0.64	NR	Unadjusted results presented in Naude as adjusted results (for sex, ethnicity, baseline BMI, total energy intake) didn’t alter results	Convenience sample No sample size justification

Table A8.8 Protein intake and obesity outcomes

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total protein intake and BMI										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
Protein and Odds of overweight	PCS (Gunther et al 2007) (203) Germany	12 months, 18 to 24 months	Age 7 years	Median protein intake % energy (25th to 75th percentiles) at age 18-24m Median low intake: 13.3% (11.8 to 14.7%) Median high intake: 13.8% (12.9 to 15.2%) 3-day weighed	Standardised BMI (BMI SDS) Measurements performed by trained nurses* Overweight defined as BMI >75th percentile of German reference curves*	Those children with consistently high protein intakes from age 12 months, 18 to 24 months versus children with lower protein intakes:	See previous column	See previous column	Sex, baseline BMI SDS, total energy intake, fat intake (% energy), firstborn status, maternal weight, educational attainment, gestational age, maternal smoking, breastfeeding, siblings in dataset*	Power calculation DONALD cohort

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				records at 12, 18 and 24m		a) BMI SDS 0.37 (95% CI 0.12 to 0.61) vs 0.08 (95% CI -0.09 to 0.26); p=0.04 b) OR for overweight at age 7: 2.39 (1.14 to 4.99) p=0.02				
Protein and BMI	PCS (Ohlund et al 2010) (127) Sweden	17 to 18 months	Age 4 years	Mean protein intake (% energy) 13.6% (SD 1.6) Monthly 5-day food records	BMI Weight measured using digital scale and height measured by infantometer (at 18m) and	Protein intake associated with higher BMI (details NR)	NR	NR	Total energy intake, macronutrient intake (absolute intake in grams), parental BMI when child was aged 4 years*	No power calculation Loss to follow up >20%

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
					stadiometer (at 4 years)					
Protein and BMI	PCS (Scaglioni et al 2000) (147) Italy	1 year	Age 5 years	Mean protein intake (% energy) Age-adjusted FFQ and 24h recalls at baseline and follow-up	BMI Overweight defined by BMI over the 90th centile of the age- and sex-adjusted Rolland-Cachera curves (Rolland-Cachera et al 1982)* Measurements performed by 2 paediatricians	(a) Children aged 5 years with overweight had a higher intake of protein (% energy) at age 1 year than children with healthy weight (22% vs 20%) (b) Protein intake at 1 year of age was	NR	(a) 0.024 (b) 0.05	Sex, weight and length at birth and 1 year, other macronutrients (% energy), parental age and weight status*	Measurement errors in dietary reporting not considered No power calculation

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						associated with overweight at 5 years after adjustment				
Protein and BMI	PCS (Skinner et al 2004) (70) USA	2 to 8 years	Age 8 years	Mean longitudinal protein intake at age 2 to 8 years (14% energy) 24 hour recalls until age 20 months; 3-day records (2 food records and a 24h recall) at ages 24 to 36 months	BMI Measurements performed by dietician	Mean longitudinal protein intake (in g)* at age 2 to 8 years was a predictor of BMI at 8 years 0.01 (SE 0.01)*	NR	0.017*	Sex, baseline BMI, birthweight, age at adiposity rebound, age at cereal introduction, breastfeeding duration, dietary variety, sedentary activity, mother's perception of child as picky eater at age 6, parental BMI*	No power calculation Most of sample from upper SES families; a single racial group was selected
	Parsons et al (1999) AMSTAR 2 confidence rating: critically low									

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Protein and BMI	PCS (Rolland-Cachera et al, 1995) (112) France	2 years	Age 8 years	Protein intake (% energy) Interviews conducted by dietician – diet history, capturing usual eating patterns	BMI Objectivity of assessment NR	Correlation coefficient 0.28*	NR	0.008*	BMI and energy intake at 2 years, parental BMI, SES*	60% drop out
Total protein and body fat										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
Protein and body fat	PCS (Gunther et al 2007) (203) Germany	12 months, 18 to 24 months	Age 7 years	Median protein intake % energy (25th to 75th percentiles) Median low intake: 13.3% (11.8 to 14.7%) Median high intake: 13.8% (12.9 to 15.2%)	Body fat % The 75th percentile of body fat reference curves based on % body fat values measured by bioelectric impedance analysis in	Those children with consistently high protein intakes from age 12 months, 18 to 24 months had a OR for % body	1.06 to 4.88	0.03	Sex, child baseline BMI % body fat, total energy intake fat intake (% energy), firstborn status, maternal weight, educational attainment, gestational	DONALD cohort Power calculation reported

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
					British children; McCarthy et al, 2006	fat >75th percentile: 2.28 (1.06 to 4.88) than children with a low protein intake			age, maternal smoking, breastfeeding, siblings in dataset*	
	Parsons et al (1999) AMSTAR 2 confidence rating: critically low									
Protein and body fat	PCS (Rolland-Cachera et al, 1995) (112) France	2 years	Age 8 years	Protein intake (% energy)	(1) Subscapular skinfold (total body fat) (2) Triceps skinfold (body fat %)	Correlation coefficients (1) 0.20* (2) 0.11*	NR	(1) 0.004* (2) 0.30*	BMI and energy intake at 2 years, parental BMI, SES *	60% drop out
Animal protein intake and BMI										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
Animal protein and BMI	PCS (Gunther et al 2007) (203) Germany	12 months, 5 to 6 years	Age 7 years	Median protein intake % energy (25th to 75th percentiles)	BMI SDS	(1) Animal protein at 12 months associated with higher	NR	(1) 0.002	Sex, child baseline BMI SDS, total energy intake fat intake (%	DONALD cohort Power calculation reported

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				at age 18-24m 13.8% (12.9 to 15.2%)		BMI at 7 years (data NR) (2) Dairy intake at 12m but not meat or cereal intake associated with BMI (data NR)		(2) 0.02	energy), firstborn status, maternal weight, educational attainment, gestational age, maternal smoking, breastfeeding*	
	Dougkas et al (2019) AMSTAR 2 confidence rating: low									
Animal protein (dairy) and BMI	PCS (Braun et al 2016) (3564) USA	12 months (1 year)	8 years	Dairy protein (g per day)	(1) BMI (2) Body weight	A 10g higher dairy protein intake (per day) at 1 year was associated with (1) 0.07 SD increase in BMI	(1) 0.02 to 0.11 (2) 0.03 to 0.12	(1 and 2) <0.05	Birth weight z score, breastfeeding, playing sports, household income, maternal BMI at study enrolment, education, folic acid use during pregnancy,	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						(2) 0.07 SD increase in body weight However, there was no difference in effect sizes between dairy and non-dairy sources of protein.			smoking during pregnancy and non-dairy animal protein	
Animal protein intake and body fat										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
Animal protein and body fat	PCS (Gunther et al 2007) (203) Germany	12 months, 5 to 6 years	Age 7 years	Median protein intake % energy (25th to 75th percentiles) at 12 months 13.3% (11.7 to 14.8%)	Body fat %	(1) Animal protein at 12 months and 5 to 6 years associated with higher % body fat	NR	(1) 0.01	Sex, child baseline BMI SDS, total energy intake fat intake (% energy), firstborn status,	DONALD cohort

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						(2) Dairy intake but not meat or cereal intake associated with BMI		(2) 0.07	maternal weight, educational attainment, gestational age, maternal smoking, breastfeeding*	
Vegetable protein intake and BMI										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
Vegetable protein and BMI	PCS (Gunther et al 2007) (203) Germany	12 months, 5 to 6 years	Age 7 years	Median protein intake % energy (25th to 75th percentiles) 13.8% (12.9 to 15.2%)	BMI SDS	Vegetable protein intake at 12m not associated with BMI at 7 years (data NR)	NR	NS (p-value NR)	Sex, child baseline BMI SDS, total energy intake, fat intake (% energy), fibre intake (g per kcal), firstborn status, maternal weight, educational attainment, gestational age, maternal	DONALD cohort

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									smoking, breastfeeding*	
Vegetable protein intake and body fat										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
Vegetable protein and body fat	PCS (Gunther et al 2007) (203) Germany	12 months, 5 to 6 years	Age 7 years	Median protein intake % energy (25th to 75th percentiles) at 12 m 13.3% (11.7 to 14.8%)	% body fat	Vegetable protein intake at 12 months not associated with % body fat at 7 years (data NR)	NR	NS (p-value NR)	Sex, child baseline % body fat, total energy intake, fat intake (% energy), fibre intake (g per kcal), firstborn status, maternal weight, educational attainment, gestational age, maternal smoking, breastfeeding, *	DONALD cohort

Table A8.9 Protein intake and growth outcomes

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total protein intake and adiposity rebound (AR)										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
Protein and age at AR	PCS (Dorosty et al 2000) 772 UK	18 months	Variable	Protein (g per day)	Timing of AR	No association between protein intake and timing of AR (data NR)	NR	NS (p-value NR)	Analyses stratified by sex*	ALSPAC cohort Parental BMI and having at least 1 obese parent predictive of very early (≤43 months) or early (49 to 60 months) AR

Protein and age at AR	PCS (Gunther et al 2006) (313) Germany	12 to 24 months	Up to age 7 years	Protein (% energy)	Timing of AR	No association between habitual protein intake and timing of AR (data NR)	NR	p>0.05*	Gestational age, breastfeeding, energy intake, maternal BMI, siblings in data set*	DONALD cohort No power calculation
Protein and BMI at AR	PCS (Gunther et al 2006) (313) Germany	12 to 24 months	Up to age 7 years	Protein (% energy)	BMI-SDS at AR	Girls in highest tertile of protein intake had a significantly higher BMI-SDS at AR than those in the lowest tertile of protein intake (mean difference NR)	NR	<0.05*	Gestational age, breastfeeding, energy intake, maternal BMI, siblings in data set*	DONALD cohort No power calculation

Animal protein intake and peak linear growth velocity (PLGV)										
Animal protein and PLGV	PCS (Berkey et al 2000) (67 girls) USA	3 to 5 years	Variable	Animal protein (g per day) age and energy-adjusted, expressed as log residuals entered into models*	PGV	Higher animal protein intake associated with higher PLGV (data NR)	NR	<0.05*	Baseline height and BMI, age-adjusted total energy intake at age 1 to 2, and age or energy-adjusted intakes of vegetable protein and total fat (g per day)*	Study conducted in the women born in the 1930s-1940s High drop-out rate (43%) No power calculation*

Table A8.10 Protein intake and timing of puberty

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Protein (total, animal and vegetable) intake and age of menarche or voice break										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
Protein intake and age of menarche	PCS (Rogers et al 2010) (3298 girls) UK	3 years, 7 years	By age 12 years and 8 months	Total protein (g per day) Baseline dietary data collected by FFQ; validated by comparison with 3-day food records taken on 10% sample of the cohort*	Age at menarche (AAM) (defined as before or after age 12 years and 8 months) Data collected at research clinics when the girls were around age 11.5 to 12.5 years*	Total protein intake at 3 years associated with AAM ≤ 12 years and 8 months.	NR	NR	Unclear	ALSPAC cohort No power calculation * Analyses restricted to white girls from singleton births due to differences in outcome between white and non-white girls, and small number of non-white girls*

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Animal protein intake and age of menarche	PCS (Berkey et al 2000) (67 girls) USA	3 to 5 years	Variable	Animal protein (g per day) age and energy-adjusted, expressed as log residuals entered into models* Diet history covering past 6 months – method internally validated – strong correlation between daily protein intake and child's rate of growth of muscle in lower leg (correlation coefficient 0.46 in girls	Age at menarche (mean age at menarche 12.83, SD 1.09 years)*	Higher animal protein intake at age 3 to 5 years associated with earlier menarche (for every +1 SD increase in intake, menarche occurred 0.63 years earlier)	NR	<0.05 *	Baseline height and BMI, age-adjusted total energy intake at age 1 to 2, and age or energy-adjusted intakes of vegetable protein and total fat (g per day)*	No power calculation * Study conducted in the women born in the 1930s-1940s High drop-out rate (43%)

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				and 0.68 for boys)*						
Animal protein intake and age of menarche or voice break	PCS (Gunther et al 2010) (92) Germany	3 to 4 years, 5 to 6 years	Variable	Animal protein intake (% energy; age- and sex-standardised) Meat and dairy protein (% energy) 3-day weighed records at age 3, 4, 5, 6 years Urinary samples for urinary nitrogen excretion for validating dietary data	Age at menarche or voice break	Higher animal protein intake (especially from cows' milk) tended to be associated with earlier menarche per voice break (data NR)	NR	0.06	Sex, birth year, birth weight, breastfeeding duration, rapid weight gain 0-2y, total energy intake, fat intake (% energy), total protein (% energy) and vegetable protein (% energy), maternal overweight, paternal education*	Power calculation performed*

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				collected from 57 children						
Animal protein intake and age of menarche	PCS (Rogers et al 2010) (3298 girls) UK	3 years, 7 years	By age 12 years and 8 months	Animal protein Meat protein (g per day) Baseline dietary data collected by FFQ; validated by comparison with 3-day food records taken on 10% sample of the cohort*	Age at menarche (AAM) (defined as before or after age 12 years and 8 months) Data collected at research clinics when the girls were around age 11.5 to 12.5 years*	Animal protein intake at 3 years associated with AAM ≤ 12 years and 8 months. Meat intake at 3 years strongly associated with reaching menarche by 12 years and 8 months.	NR	NR	Unclear	ALSPAC cohort No power calculation * Analyses restricted to white girls from singleton births due to differences in outcome between white and non-white girls, and small number of

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
										non-white girls*
Vegetable protein intake and age of menarche	PCS (Berkey et al 2000) (67 girls) USA	3 to 5 years	Variable	Vegetable protein (g per day) age and energy-adjusted, expressed as log residuals entered into models*	Age at menarche (mean age at menarche 12.83, SD 1.09 years)*	Higher vegetable protein intake at age 3 to 5 years associated with later menarche (data NR)	NR	<0.05*	Baseline height and BMI, age-adjusted total energy intake at age 1 to 2, and age or energy-adjusted intakes of vegetable protein and total fat (g per day)*	No power calculation* Study conducted in the women born in the 1930s-1940s High drop-out rate (43%)

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Vegetable protein intake and age of menarche or voice break	PCS (Gunther et al 2010) (92) Germany	3 to 4 years, 5 to 6 years	Variable	Vegetable protein (% energy, age standardised)	Age at menarche or voice break	Higher vegetable protein intake was associated with later menarche or voice break (data NR)	NR	0.02	Sex, birth year, birth weight, breastfeeding duration, rapid weight gain 0-2y, total energy intake, fat intake (% energy), total protein (% energy) and animal protein (% energy) intake, fibre intake (g per day) maternal overweight, paternal education*	Power calculation performed*
Protein (animal and vegetable) intake and age at onset of pubertal growth spurt										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Animal protein and age at onset of pubertal growth spurt	PCS (Gunther et al 2010) (112) Germany	3 to 4 years	Variable	Animal protein (% energy)	Age at onset of pubertal growth spurt	Children in the highest tertile of animal protein intake at age 3 to 4 years experienced earlier onset of pubertal growth at mean age 9.0 (95% CI 8.7 to 9.3) compared with age 9.7 (95% CI 9.4 to 10.0) in children in the lowest tertile*	NR	<0.05 *	Sex, birth year, birth weight, breastfeeding duration, rapid weight gain 0-2y, total energy intake, fat intake (% energy), total protein (% energy) and vegetable protein (% energy), maternal overweight, parental education*	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Vegetable protein and age at onset of pubertal growth spurt	PCS (Gunther et al 2010) (112) Germany	3 to 4 years, 5 to 6 years	Variable	Animal protein (% energy)	Age at onset of pubertal growth spurt	Children in the highest tertile of vegetable protein intake at age 3 to 4 years experienced later onset of pubertal growth spurt at age 9.6 (95% CI 9.2 to 9.9) compared with age 9.1 (95% CI 8.8 to 9.4) in children in the lowest tertile*	See previous column	p-trend =0.01	Sex, birth year, birth weight, breastfeeding duration, rapid weight gain 0-2y, total energy intake, total protein (% energy) and animal protein (% energy) intake, fibre intake (g per day), maternal overweight, parental education*	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Protein (animal and vegetable) intake and age at peak linear growth velocity (PLGV)										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
Animal protein and age at PLGV	PCS (Gunther et al 2010) (112) Germany	3 to 4 years	Variable	Animal protein (% energy)	Age at PLGV	Children in the highest tertile of animal protein intake at age 3 to 4 years experienced PGV at mean age 12.0 (95% CI 11.7 to 12.3) compared with age 12.5 (95% CI 12.2 to 12.9) in children in the lowest tertile	NR	<0.05	Sex, birth year, birth weight, breastfeeding duration, rapid weight gain at 0 to 2 years, total energy intake, fat intake (% energy), total protein (% energy) and vegetable protein (% energy), maternal overweight, parental education*	None

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Vegetable protein and age at PLGV	PCS (Gunther et al 2010) (112) Germany	3 to 4 years	Variable	Vegetable protein (% energy)	Age at PLGV	Children in the highest tertile of vegetable protein intake at age 3 to 4 years experienced PLGV at mean age 12.6 (12.3 to 13.0) compared with age 12.1 (11.8 to 12.5) in children in the lowest tertile	NR	p-trend =0.02	Sex, birth year, birth weight, breastfeeding duration, rapid weight gain at 0 to 2 years, total energy intake, total protein (% energy) and animal protein (% energy) intake, fibre intake (g per day), maternal overweight, parental education*	None

Table A8.11 Protein intake and other health outcomes

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total protein intake and blood lipids										
	Voortman et al (2015b) AMSTAR 2 confidence rating: low									
Protein and blood lipids	PCS (Cowin et al 2000) (389) UK	18 months	Age 31 months	Protein intake (% energy) Mean protein intake 15% (males) and 15.1% (females)	(1) TC (2) LDL-C (3) HDL-C (4) TAG	(1) 0.00 (M), -0.07 (F) (2) -0.04 (M), -0.17 (F) (3) -0.07 (M), 0.06 (F) (4) NR	NR	NS (all >0.05)	Analysis stratified by sex, non-white children were excluded from the analysis Total energy intake and intakes of saturated fat and PUFA (unclear if % energy or absolute intake)	None
Total protein intake and bone health										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									

Protein and bone health	PCS (Bounds et al 2005) (52) USA	2 to 8 years	Age 8 years	Protein intake (g)	Bone mineral content (BMC)(g) Bone mineral density (BMD) (g per cm^2)	Longitudinal intakes of protein (from age 2 to 8 years) correlated with BMC and BMD	NR	≤0.05	NR – not clear	Analysis in white children only
Total protein intake and neurodevelopment										
	Hornell et al (2013) AMSTAR 2 confidence rating: moderate									
Protein intake and neurodevelopment	PCS (Rask-Nissila, 2002) (496) Finland	8 months to 5 years	Age 5 years	Protein intake (% energy)	Speech and language skills Gross motor performance Perception	Protein intake at age 4 years predicted gross motor function and perception at age 5 years*	NR	NR	Analyses stratified by sex*	STRIP cohort

Table A8.12 Iron fortification of food and iron status

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron fortification of food and serum haemoglobin (Hb)										
	Athe et al (2013) AMSTAR 2 confidence rating: low									
Iron fortification and Hb	MA of 18 trials (6 were double blind, 2 were cluster randomised trials and the remaining 10 were randomised trials) (5142) Mainly LMIC	Mean age 4.7 years (SD 3.0 years)	Mean duration: 6.5 months (SD 4.2 months)	Iron-fortified foods (milk, orange juice, cereal-based staple foods, water). Main fortificant: ferrous sulphate	Hb	Mean change from baseline significantly higher in the Fe-fortified group than in the control: Weighted mean difference (WMD) 5.09 g/l	3.23 to 6.95g/l	<0.00001	Meta-regression: duration of intake of fortified food is an effective confounder. After removal of confounders (including study duration): WMD 4.74g/l (95% CI 3.08 to 6.40).	I^2=90% Random-effects model No information provided on type of analysis conducted by studies (Intention to treat [ITT] or per protocol [PP]) Probable absence of

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
										publication bias. Findings not stratified by baseline iron status
	Matsuyama et al (2017) AMSTAR 2 confidence rating: moderate									
Iron fortification and Hb	MA of 8 trials (RCTs) (NR) 5 of 8 trials in HIC including 3 in UK (% weighting in MA NR)	Up to 5 years (5 of 8 trials in children aged 1 to 5 years; % weighting in MA NR)	NR Minimum 4 months' duration	Fortification of milk or formula with iron (with or without other micronutrients, principally zinc or vitamin D) Control group: non-fortified milk or formula	Hb	MD 5.89g/l Change from baseline	-0.25 to 12.02g/l	0.06	N/A	I^2 NR Random-effects model Findings not stratified by baseline iron status No information provided on type of analysis conducted by studies (ITT or PP)

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
										One review author partially funded by Danone Nutricia. Funding source bias of the 8 RCTs was either unclear or low risk
	Pratt (2015) AMSTAR 2 confidence rating: critically low									
Iron fortification and Hb	Randomised trial (Rosado et al 2010) (2666) Mexico	36 months	4 months	4 intervention groups: - 10mg iron in micronutrient-fortified complementary food (also fortified with	Hb	All treatments significantly increased Hb (no control group)	NR	NR	NR	43 to 44% anaemia prevalence* PP analysis* Power calculation*

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				zinc, vitamin A and folic acid) - 20mg iron in iron supplement group - 12.5mg in iron and folic supplement group -10mg in multiple micronutrient supplement group - 6.7mg iron in fortified water group						
Iron fortification and Hb	Cluster-randomised trial (Lundeen et al 2010) (2283) Kyrgyz Republic	6 to 36 months	2 months	Daily home fortification of complementary foods in the diet using 12.5mg micronutrient	Hb (g/l)	Intervention group: mean Hb concentration increased by 7g/l from 101.0	NR	<0.001 (for difference in change	N/A	- Mean baseline Hb in both intervention and control groups was approximately 100g/l;

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				powder (Sprinkles) The control group did not receive the micronutrient powder until after the study period* Each sachet of micronutrient powder contained 12.5mg elemental iron, 300mcg vitamin A, 5mg zinc, 30mg vitamin C, 160mcg folic acid		g/l at baseline to 108.1 g/l at follow-up Control group: mean Hb concentration decreased by 2g/l from 100.3g/l to 98.6g/l * p<0.001 for difference between intervention and control groups (mean Hb at follow-up as well		from baseline*)		anaemia prevalence 72%* - Power calculation* - Attrition 14%; PP analysis* - Clustering effects adjusted for* - Study setting*: impoverished communities where nutritional iron deficiency and other forms of micronutrient malnutrition are common among

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						as change in Hb concentration from baseline)* MD not reported				young children
Iron fortification of food and serum ferritin										
	Matsuyama et al (2017) AMSTAR 2 confidence rating: moderate									
Iron fortification and serum ferritin	RCT (Szymlek-Gay et al 2009) (125 healthy children without anaemia)* New Zealand	Mean 16.8 months	5 months	Daily consumption of - 1.5mg iron per 100ml in cows' milk group - 2.6mg iron in red meat group (approximately 56g) - 0.01mg iron in control milk (whole cows' milk)	Serum ferritin (controlled for C-reactive protein [CRP]*)	Increase in mean serum ferritin levels in the fortified milk group from baseline and decreased in the control group (p=0.06 for	NR	NR	N/A	- Power calculation* - ITT analysis* - Low risk of bias from funding source - Groups receiving milk (intervention or control) had a significantly higher compliance

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				Fortified milk also contained zinc, vitamins A, C and D, and B vitamins Control milk contained vitamin A and D		decrease)* (quantitative data not reported)				rate (81.4% and 89.4%) compared with the meat group (3.4%)
Iron fortification and serum ferritin	RCT (Virtanen et al 2001) (36 healthy children without anaemia)* Sweden	12 months	6 months	Milk fortified with iron (and vitamin C) vs non-fortified milk	Serum ferritin All children had normal CRP concentration at baseline and at the end of the intervention*	No statistically significant difference in change from baseline serum ferritin between groups	NR	0.06	N/A	-Power calculation but not for serum ferritin* -PP analysis* -Low risk of bias from funding source

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron fortification and serum ferritin	RCT (Sazawal et al 2010) (570 children with anaemia)* India	Mean 22.4 months (intervention group) 23 months (control group)	12 months	Milk fortified with iron, zinc, vitamin A (and other micronutrients) vs control milk (also fortified but with lower doses of iron, zinc and vitamin A) – part of a public health intervention	Serum ferritin (unclear whether adjusted for CRP)	Increase in serum ferritin levels among the fortified milk group compared with the control group after 1 year of intervention (quantitative data not reported)	NR	NR	N/A	-Power calculation (but not for serum ferritin)* - ITT analysis -Low risk of bias from funding source
Iron fortification and serum ferritin	RCT (Villalpando et al 2006) (115) Mexico	Mean 20.4 months (intervention group)	6 months	Milk fortified with iron (5.8mg per 400ml daily portion), zinc vitamin A, folic acid vs milk not fortified by	Serum ferritin (unadjusted for CRP*)	No statistically significant difference in change from baseline serum ferritin	NR	NR	N/A	- 41% anaemia prevalence in intervention group; 30% in control group*

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
		22.5 months (control group)		iron, zinc and folic acid (but fortified with vitamin A) – part of a public health intervention programme		between groups (quantitative data not reported)				- Power calculation (but not for serum ferritin)* - PP analysis* -Unclear risk of bias from funding source
	Pratt (2015) AMSTAR 2 confidence rating: critically low									
Iron fortification and serum ferritin	RCT (Szymlek-Gay et al 2009) (125) New Zealand	Mean 16.8 months	5 months	Daily consumption of - 1.5mg iron per 100ml in cows' milk group - 2.6mg iron in red meat group (approximately 56g) - 0.01mg iron in control	Serum ferritin	Compared with the control group, serum ferritin (a) higher in the fortified cows' milk group (b) higher in the red	NR	(a) <0.001 (b) 0.033		Healthy, non-anaemic children Also reported in Matsuyama but more details provided

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				group (whole cows' milk) Milk also fortified with vitamin C, zinc and vitamin D		meat group Serum ferritin increased by 44% in cows' milk group (p=0.002) and did not change in the red meat group				
Iron fortification and serum ferritin	Randomised trial (Rosado et al 2010) (2666) Mexico	36 months	4 months	4 intervention groups: - 10mg iron in micronutrient-fortified porridge powder (also fortified with zinc, vitamin A, vitamin C and folic acid)*	Serum ferritin (adjusted for CRP*)	No change in serum ferritin after 4 months intervention in any of the treatment groups	NR	NR	NR	- 43 to 44% anaemia prevalence* - PP analysis* - Power calculation (but not for serum ferritin)*

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				- 20mg iron in iron supplement group - 12.5mg in iron and folic supplement group -10mg in multiple micronutrient supplement group - 6.7mg iron in fortified water group						
Iron fortification of food and iron deficiency (ID)										
	Pratt (2015) AMSTAR 2 confidence rating: critically low									
Iron fortification and ID	Double-blinded, cluster*-randomised trial (Rivera et al 2010) (795)	12 to 30 months	12 months	Assessment of the effectiveness of a large-scale programme that distributed	Prevalence of ID (assessed as serum ferritin <12μg/l)	Intervention group: estimated prevalence of serum ferritin <12μg/l at	NR	0.006*	Findings adjusted for cluster effects, child's age, and SES	Baseline anaemia prevalence: 45% in intervention group

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Mexico			iron-fortified milk on anaemia and ID Daily portion of fortified milk contained 5.28mg iron (per 400ml) vs control milk* Intervention and control milks also differed in their content of zinc, vitamin A and C (with the intervention milk containing higher doses of these)*		baseline: 29.8% after 6 months: 18.6% after 12 months 5.7% Control group: estimated prevalence of serum ferritin <12µg/l at baseline: 36.0% after 6 months: 41.8% after 12 months 17.1%				43% in control group -PP analysis* - Adjustment for cluster effects* - Imbalance between intervention and control group numbers (n=144 vs 43)*

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron fortification of food and anaemia										
	Matsuyama et al (2017) AMSTAR 2 confidence rating: moderate									
Iron fortification and odds of anaemia	MA of 9 RCTs (NR) 4 of 9 trials in HIC including 3 in UK (% weighting in MA NR)	Up to 5 years (5 of 9 trials in children aged 1 to 5 years; % weighting in MA NR)	NR	Fortification of milk or formula with iron (with or without other micronutrients, principally zinc or vitamin D) Control group: non-fortified milk or formula	Anaemia	OR 0.32	0.15 to 0.66	NR	N/A	I^2=75.2% - Random-effects model - Findings not stratified by baseline iron status - One review author partially funded by Danone Nutricia. - Funding source bias of the 9 RCTs was either unclear or low risk -Funnel plot for anaemia

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
										showed symmetry, suggesting minimal publication bias -No information provided on type of analysis conducted by studies (ITT or PP)
Iron fortification and odds of anaemia	Subgroup MA of 6 RCTs (NR) Countries NR	Age >12 months at baseline	NR	Fortification of milk or formula with iron (with or without other micronutrients, principally zinc or vitamin D) Control group: non-	Anaemia	OR 0.46	0.19 to 1.12	NR	N/A	As above

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				fortified milk or formula						
	Pratt (2015) AMSTAR 2 confidence rating: critically low									
Iron fortification and anaemia prevalence	Cluster-randomised trial (Lundeen et al 2010) (2283) Kyrgyz Republic	6 to 36 months	2 months	Daily home fortification of complementary foods in the diet using 12.5mg micronutrient powder (Sprinkles) The control group did not receive the micronutrient powder until after the study period* Each sachet of	Anaemia prevalence (assessed by Hb <110g/l)	Intervention group: prevalence of anaemia decreased from 72% at baseline to 52% at follow-up Control group: Prevalence of anaemia increased from 72%	NR	<0.001 (for difference between groups at follow-up*)	N/A	Mean baseline Hb in both intervention and control groups was approximately 100g/l; anaemia prevalence 72%* Hb decreased from baseline to follow-up in the control group from

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				micronutrient powder contained 12.5mg elemental iron, 300mcg vitamin A, 5mg zinc, 30mg vitamin C, 160mcg folic acid		to 75% at follow-up*				100.2 to 98.6g/l - Power calculation* - Attrition 14%; PP analysis* - Clustering effects adjusted for* - Study setting*: impoverished communities where nutritional iron deficiency and other forms of micronutrient malnutrition are common among

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
										young children
Iron fortification and anaemia prevalence	Double-blinded, group-randomised effectiveness trial (Rivera et al 2010) (795) Mexico	12 to 30 months	12 months	Assessment of the effectiveness of a large-scale programme that distributed iron-fortified milk on anaemia and ID Daily portion of fortified milk contained 5.28mg iron (per 400ml) vs control milk*	Anaemia prevalence (assessed by Hb <110g/l)	Intervention group: estimated prevalence of anaemia from baseline to 6 and 12 months decreased from 44.5% to 12.7% and 4.0%, respectively Control group:	NR	0.02	N/A	Baseline anaemia prevalence 43% - PP analysis* - Adjustment for cluster effects*

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				Intervention and control milks also differed in their content of zinc, vitamin A and C (with the intervention milk containing higher doses of these)*		estimated prevalence of anaemia from baseline to 6 and 12 months decreased from 42.6%, 19.7% and 9.4%, respectively				
Iron fortification and anaemia prevalence	RCT (Villalpando et al 2006) (115) Mexico	10 to 30 months	6 months	Milk fortified with iron (5.8mg per 400ml daily portion), zinc vitamin A, folic acid vs milk not fortified by iron, zinc and folic acid (but fortified with	Anaemia prevalence (anaemia defined as <110g/l*)	Intervention group: prevalence of anaemia declined from 41.4% to 12.1%; p<0.001	NR	See measure of association or effect column	N/A	41% anaemia prevalence in intervention group; 30% in control group* - Power calculation (for anaemia prevalence)*

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Intervention	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				vitamin A) – part of a public health intervention programme		Control group: no change – 30% to 24%; p=0.40 Treatment with fortified milk was inversely associated with the likelihood of being anaemic after the 6 month intervention (p<0.03); adjusted for age, sex and baseline anaemia*				- PP analysis* -Unclear risk of bias from funding source (Matsuyama)

Table A8.13 Iron supplementation and iron status

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and haemoglobin (Hb)										
	Thompson et al (2013) AMSTAR 2 confidence rating: moderate									
Iron supplementation and Hb	MA of 9 trials (RCTs or quasi-randomised) (2154) Mainly low- and middle-income countries (LMIC)	2 to 5 years	1 to 12 months	Daily iron supplementation (10 to 82.5mg) vs control	Hb	MD 6.97g/l	4.21 to 9.72	<0.00001	N/A	I^2=82% Random-effects model
Iron supplementation and Hb	Subgroup MA of 4 trials (without anaemia at baseline participant	2 to 5 years	NR	Daily iron supplementation (10 to 82.5mg) vs control	Hb	MD 3.91g/l	NR	0.03	N/A	I^2=62% Random-effects model Anaemia not defined

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	number NR)									
Iron supplementation and Hb	Subgroup MA of 4 trials (with anaemia at baseline, participant number NR)	2 to 5 years	NR	Daily iron supplementation (10 to 82.5mg) vs control	Hb	MD 11.77g/l	NR	0.0001	N/A	I^2=82% Random-effects model Anaemia not defined
Iron supplementation and Hb	Subgroup MA of 2 trials (iron replete at baseline participant number NR)	2 to 5 years	NR	Daily iron supplementation(10 to 82.5mg) vs control	Hb	MD 2.28g/l	NR	0.07	N/A	I^2=0% Random-effects model Iron deficiency not defined

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and Hb	Subgroup MA of 3 trials (baseline iron deficiency participant number NR)	2 to 5 years	NR	Daily iron supplementation (10 to 82.5mg) vs control	Hb	MD 9.06g/l	NR	0.0006	N/A	I^2=0% Random-effects model Iron deficiency not defined
	De-Regil et al (2011) AMSTAR 2 confidence rating: high									
Iron supplementation and Hb	MA of 9 trials (1254) LMIC	0 to 59 months	4 trials had a duration of ≤3 month and 5 trials had a duration of >3 months.	Intermittent iron supplementation vs control (most trials provided weekly doses between 25 to 75mg of elemental iron)	Hb	MD 6.45g/l	2.36 to 10.55	NR	N/A	I^2 NR Random-effects model

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and Hb	Subgroup MA of 1 trial (307 participants with anaemia at baseline)	0 to 59 months	NR	Intermittent iron supplementation vs control	Hb	MD 8.0g/l	5.0 to 11.0	NR	N/A	Random-effects model Anaemia status of children: Hb <110g/L for children aged 6 to 59 months No evidence identified in non-anaemic children
Iron supplementation and Hb	Subgroup MA of 8 trials (947 participants with mixed or unknown baseline status)	0 to 59 months	NR	Intermittent iron supplementation vs control (most trials provided weekly doses between 25-75mg of elemental iron)	Hb	MD 6.25g/l	1.60 to 10.90	NR	N/A	I^2 NR Random-effects model No evidence identified in non-anaemic children

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and serum ferritin										
	Thompson et al (2013) AMSTAR 2 confidence rating: moderate									
Iron supplementation and serum ferritin	MA of 5 trials (RCTs or quasi-randomised) (1407) Mainly low- and middle-income countries (LMIC)	2 to 5 years	1 to 12 months	Daily iron supplementation (10 to 82.5mg) vs control	Ferritin	MD 11.64µg/l	6.02 to 17.25	<0.0001	N/A	I^2=48% Random-effects model Included studies did not specify whether they used arithmetic or geometric means so SR authors also calculated SMD (SMD 0.4; 95% CI 0.22 to 0.59; p<0.0001; I^2=39%) Studies did not

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
										specifically discuss or account for the effect of inflammation or infection on ferritin.
Iron supplementation and serum ferritin	Subgroup MA of 2 trials (without anaemia at baseline participant number NR)	2 to 5 years	NR	Daily iron supplementation (10 to 82.5mg) vs control	Ferritin	MD 13.6 µg/l	NR	0.13	N/A	I^2=76% Random-effects model Anaemia not defined
Iron supplementation and serum ferritin	Subgroup MA of 3 trials (with anaemia at baseline, participant number NR)	2 to 5 years	NR	Daily iron supplementation (10 to 82.5mg) vs control	Ferritin	MD 11.39 µg/l	NR	0.03	N/A	I^2=81% Random-effects model Anaemia not defined

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and serum ferritin	Subgroup MA of 2 trials (iron replete at baseline participant number NR)	2 to 5 years	NR	Daily iron supplementation (10 to 82.5mg) vs control	Ferritin	MD 14.34 µg/l	NR	0.16	N/A	I^2=78% Random-effects model Iron deficiency not defined
Iron supplementation and serum ferritin	Subgroup MA of 3 trials (baseline iron deficiency participant number NR)	2 to 5 years	NR	Daily iron supplementation (10 to 82.5mg) vs control	Ferritin	MD 13.01 µg/l	NR	0.02	N/A	I^2=82% Random-effects model Iron deficiency not defined
	De-Regil et al (2011) AMSTAR 2 confidence rating: high									
Iron supplementation and serum ferritin	MA of 4 trials (310) LMIC	0 to 59 months	1 trial had a duration of ≤3 month and 3 trials had a	Intermittent iron supplementation vs control (most trials provided weekly doses between 25	Ferritin	MD 13.15 µg/l	-2.28 to 28.59	NR	N/A	I^2 NR

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
			duration of >3 months.	to 75mg of elemental iron)						
Iron supplementation and serum ferritin	Subgroup MA of 1 trial (74 participants non-anaemic at baseline)	0 to 59 months	NR	Intermittent iron supplementation vs control (most trials provided weekly doses between 25 to 75mg of elemental iron)	Ferritin	MD 2.46 µg/l	-14.37 to 19.29	NR	N/A	No evidence identified in anaemic children (Hb <110g/L)
Iron supplementation and serum ferritin	Subgroup MA of 3 trials (236 participants with mixed or unknown	0 to 59 months	NR	Intermittent iron supplementation versus control (most trials provided weekly doses	Ferritin	MD 16.12 µg/l	-1.81 to 34.05	NR	N/A	I^2 NR

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	baseline status)			between 25 to 75mg of elemental iron)						
Iron supplementation and iron deficiency (ID)										
	De-Regil et al (2011) AMSTAR 2 confidence rating: high									
Iron supplementation and ID	MA of 3 trials (431) LMIC	0 to 59 months	NR	Intermittent iron supplementation vs control (most trials provided weekly doses between 25 to 75mg of elemental iron)	ID	RR 0.24	0.06 to 0.91	NR	N/A	I^2 NR Not enough studies (<4) to carry out subgroup analysis by anaemia status at baseline
Iron supplementation and anaemia										
	De-Regil et al (2011) AMSTAR 2 confidence rating: high									

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and anaemia	MA of 4 trials (658) LMIC	0 to 59 months		Intermittent iron supplementation vs control (most trials provided weekly doses between 25 to 75mg of elemental iron)	Anaemia	RR 0.43	0.23 to 0.80	NR	N/A	I^2 NR
Iron supplementation and anaemia	Subgroup MA of 1 trial (307 children with anaemia at baseline)	0 to 59 months	NR	Intermittent iron supplementation vs control (most trials provided weekly doses between 25 to 75mg of elemental iron)	Anaemia	RR 0.61	0.49 to 0.74	NR	N/A	Anaemia status of children: Hb <110g/L for children aged 6 to 59 months No evidence identified in non-anaemic children

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and anaemia	Subgroup MA of 3 RCTs (351 children mixed or unknown status at baseline)	0 to 59 months	NR	Intermittent iron supplementation vs control (most trials provided weekly doses between 25 to 75mg of elemental iron)	Anaemia	RR 0.26	0.07 to 1.03	NR	N/A	I^2 NR

Table A8.14 Iron supplementation and growth

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and body weight										
	Thompson et al (2013) AMSTAR 2 confidence rating: moderate									
Iron supplementation and body weight (endpoint)	MA of 3 trials (RCTs or quasi-randomised) (participants NR) Mainly low- and middle-income countries (LMIC)	2 to 5 years	1 to 12 months	Daily iron supplementation (10 to 82.5mg) vs control	Body weight (endpoint)	MD 0.15kg	-0.22 to 0.51	0.44	N/A	I^2=38% Stratification by baseline status either not performed or not reported
Iron supplementation and change in body weight	MA of 4 trials (RCTs or quasi-randomised)	2 to 5 years	NR	Daily iron supplementation (10 to 82.5mg) vs control	Change from baseline in body weight	MD -0.06kg	-0.14 to 0.02	0.15	N/A	I^2=0% Random-effects model Stratification by baseline status either

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	(participants NR) Mainly LMIC									not performed or not reported
Iron supplementation and change in weight z-score	MA of 3 trials (RCTs or quasi-randomised) (participants NR) Mainly LMIC	2 to 5 years	NR	Daily iron supplementation (10 to 82.5mg) vs control	Change from baseline in weight z-score	MD -0.04	-0.12 to 0.05	0.43	N/A	I^2=0% Random-effects model Stratification by baseline status either not performed or not reported
Iron supplementation and length or height										
	Thompson et al (2013) AMSTAR 2 confidence rating: moderate									

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and height (endpoint)	MA of 3 trials (RCTs or quasi-randomised) (participants NR) Mainly LMIC	2 to 5 years	1 to 12 months	Daily iron supplementation (10 to 82.5mg) vs control	Height (endpoint)	MD 0.19cm	-1.33 to 0.94	0.74	N/A	I^2=0% Stratification by baseline status either not performed or not reported
Iron supplementation and change in height	MA of 3 trials (RCTs or quasi-randomised) (participants NR) Mainly LMIC	2 to 5 years	1 to 12 months	Daily iron supplementation (10 to 82.5mg) vs control	Change from baseline in height	MD 0.26cm	-0.49 to 1.01	0.50	N/A	I^2=95% Random-effects model Stratification by baseline status either not performed or not reported

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and change in height z-score	MA of 3 trials (RCTs or quasi-randomised) (participants NR) Mainly LMIC	2 to 5 years	1 to 12 months	Daily iron supplementation (10 to 82.5mg) vs control	Change from baseline in height z-score	MD -0.01	-0.14 to 0.12	0.86	N/A	I^2=83% Random-effects model Stratification by baseline status either not performed or NR

Table A8.15 Iron supplementation and neurological development

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and cognitive development										
	Pasricha et al (2013) AMSTAR 2 confidence rating: high									
Iron supplementation and cognitive development	MA of 6 RCTs (1093) Mainly MIC	4 to 23 months 61% weighting from studies with children aged 12 to 60 months	3 to 6 months	Daily iron supplementation (10 to15mg) vs control	Bayley's mental development index	MD 1.65	-0.63 to 3.94	0.16	N/A	I^2=66% Random-effects model
Iron supplementation and cognitive development	Sensitivity analysis including only studies at low risk of bias (2	No information on % weighting from	NR	Daily iron supplementation (10 to 15mg) vs control	Bayley's mental development index	MD 2.05	-1.46 to 5.55	0.25	N/A	NR

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	RCTs; participants NR)	studies in children aged 12 to 60 months								
Iron supplementation and cognitive development	Subgroup MA of 3 RCTs (113 children with anaemia at baseline – anaemia defined by individual studies but not reported by review authors)	No information on % weighting from studies in children aged 12 to 60 months	NR	Daily iron supplementation (10 to 15mg) vs control	Bayley's mental development index	MD 4.46	-9.32 to 18.24	0.53	N/A	I^2=80% Random-effects model

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and cognitive development	Subgroup MA of 5 RCTs (325 children without anaemia at baseline)	No information on % weighting from studies in children aged 12 to 60 months		Daily iron supplementation (10 to 15mg) vs control	Bayley's mental development index	MD 1.49	-1.08 to 4.07	0.25	N/A	I^2=28% Random-effects model
Iron supplementation and cognitive development	Subgroup MA of 3 RCTs (281 children with baseline iron deficiency)	9.4% weighting of MA from studies with children aged 12 to 60	NR	Daily iron supplementation (10 to 15mg) vs control	Bayley's mental development index	MD 5.90	1.81 to 10.00	0.005	N/A	I^2=34% Random-effects model

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
		months								
Iron supplementation and cognitive development	Subgroup MA of 3 RCTs (90 children – iron replete at baseline)	8% weighting from studies with children aged 12 to 60 months	NR	Daily iron supplementation(10 to 15mg) vs control	Bayley's mental development index	MD 0.65	-1.59 to 2.88	0.57	N/A	I^2=0% Random-effects model

Table A8.16 Iron supplementation and immune function

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association to effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and vomiting										
	Pasricha et al (2013) AMSTAR 2 confidence rating: high									
Iron supplementation and vomiting	MA of 3 RCTs (1020) Mainly MIC	4 to 23 months	3 to 6 months	Daily iron supplementation (10 to 15mg) vs control	Vomiting	RR 1.38	1.10 to 1.73	0.006	N/A	I^2=1% Random-effects model Not stratified by baseline nutritional status
Iron supplementation and diarrhoea										
	Pasricha et al (2013) AMSTAR 2 confidence rating: high									
Iron supplementation and diarrhoea (prevalence)	MA of 6 RCTs (1697) Mainly MIC	4 to 23 months	3 to 6 months	Daily iron supplementation (10 to 15mg) vs control	Diarrhoea prevalence	RR 1.03	0.86 to 1.23	0.78	N/A	I^2=0 Random-effects model Not stratified by baseline nutritional status

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association to effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and diarrhoea (prevalence)	Subgroup MA of 2 RCTs (442 children with anaemia at baseline)	4 to 23 months	NR	Daily iron supplementation (10-15mg) vs control	Diarrhoea prevalence	RR 0.68	0.37 to 1.27	0.23	N/A	I^2=0 Random-effects model
Iron supplementation and diarrhoea (prevalence)	Subgroup MA of 1 RCT (179 children iron replete or without anaemia at baseline)	4 to 23 months	NR	Daily iron supplementation (10-15mg) vs control	Diarrhoea prevalence	RR 0.66	0.17 to 2.57	0.55	N/A	I^2=0 Random-effects model
	Thompson et al (2013) AMSTAR 2 confidence rating: moderate									
Iron supplementation and diarrhoea	MA of 2 trials (RCTs or quasi-randomised) (294) Mainly LMIC	2 to 5 years	1 to 12 months	Daily iron supplementation (10 to 82.5mg) vs control	Episodes of diarrhoeal illnesses per child per year	MD: 0.3	NR	0.13	N/A	I^2=0 Baseline status: mixed or unknown

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association to effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and diarrhoea	Trial (Angeles et al 1993) (80) Indonesia	2 to 5 years	2 months	Daily iron (30mg) + vitamin C (10mg) vs control (vitamin C, 20mg)	Diarrhoeal episodes	Diarrhoeal episodes in iron-supplemented group vs control: 5.1 vs 16.2	NR	NR	N/A	Baseline status: Anaemic (Hb 80-110g/l) Iron deficient (not defined)
Iron supplementation and diarrhoea	Trial (Adish et al, 1997) (407) Ethiopia	24 to 60 months	3 months	Daily iron (30mg) vs placebo OR iron (30mg) and vitamin A (200000 IU) vs vitamin A (200000 IU) alone	Diarrhoeal episodes	Diarrhoeal episodes (per person per month) in iron-supplemented group vs control: 2.1 vs 1.9	NR	NR	N/A	Baseline status: mixed or unknown

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association to effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and respiratory illnesses										
	Pasricha et al (2013) AMSTAR 2 confidence rating: high									
Iron supplementation and acute respiratory infection	MA of 2 RCTs (944) Mainly MIC	4 to 23 months	3 to 6 months	Daily iron supplementation (10 to 15mg) vs control	Acute respiratory infection	RR 1.04	0.92 to 1.19	0.51	N/A	I^2=0 Random-effects model Not stratified by baseline nutritional status
Iron supplementation and lower respiratory tract infection (incidence)	MA of 3 RCTs (NR) Mainly MIC	4 to 23 months	3 to 6 months	Daily iron supplementation (10 to 15mg) vs control	Lower respiratory tract infection	Rate ratio 1.00	0.89 to 1.12	0.96	N/A	I^2=0 Random-effects model Not stratified by baseline nutritional status

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association to effect	95% CI	p-value	Variables adjusted for	Comments
	Thompson et al (2013) AMSTAR 2 confidence rating: moderate									
Iron supplementation and respiratory illness	MA of 2 trials (RCTs or quasi-randomised) (294) Mainly LMIC	2 to 5 years	1 to 12 months	Daily iron supplementation (10 to 82.5mg) vs control	Respiratory illnesses per child per year	MD: -0.06	NR	0.81	N/A	I^2=0 Baseline status: mixed or unknown
Iron supplementation and respiratory illness	Trial (Angeles et al 1993) (80) Indonesia	2 to 5 years	2 months	Daily iron (30mg) and vitamin C (10mg) vs control (vitamin C, 20mg)	Respiratory episodes	Respiratory episodes in iron-supplemented group vs control: 10.3 vs 27.0	NR	NR	N/A	Baseline status: Anaemic (Hb 80 to 110g/l) Iron deficient (not defined)

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association to effect	95% CI	p-value	Variables adjusted for	Comments
Iron supplementation and fever										
	Pasricha et al (2013) AMSTAR 2 confidence rating: high									
Iron supplementation and fever (prevalence)	MA of 4 RCTs (1318) Mainly MIC	4 to 23 months	3 to 6 months	Daily iron supplementation(10-15mg) vs control	Fever prevalence	RR 1.16	1.02 to 1.31	0.02	N/A	I^2=0 Random-effects model Not stratified by baseline nutritional status
Iron supplementation and fever (rate)	MA of 2 RCTs (NR) Mainly MIC	4 to 23 months	3 to 6 months	Daily iron supplementation(10-15mg) vs control	Fever rate	Rate ratio 1.08	0.79 to 1.47	0.63	N/A	I^2=0 Random-effects model Not stratified by baseline nutritional status

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association to effect	95% CI	p-value	Variables adjusted for	Comments
	Thompson et al (2013) AMSTAR 2 confidence rating: moderate									
Iron supplementation and fever	Trial (Angeles et al 1993) (80) Indonesia	2 to 5 years	2 months	Daily iron (30mg) and vitamin C (10mg) vs control (vitamin C, 20mg)	Fever episodes	Fever episodes occurred 1.7 times more frequently in controls than in the treatment group (13.5 vs 7.7)	NR	NR	N/A	Baseline status: Anaemic (Hb 80 to 110g/l) Iron deficient (not defined)
Iron supplementation and fever	Trial (Rosado et al, 1997) (419) Mexico	12 months	12 months	Daily iron (20mg) vs placebo OR iron (20mg) and zinc (20mg) vs zinc alone (20mg)	Fever episodes	No significant difference in number of episodes of fever Iron vs placebo: 60 vs 48 episodes Iron and zinc vs	NR	NR	N/A	Baseline status: mixed or unknown

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association to effect	95% CI	p-value	Variables adjusted for	Comments
						zinc alone: 43 vs 53 episodes				
Iron supplementation and fever (rate)	Trial (Smith et al, 1989) (1382) Gambia	6m to 5 years	3 months	3 to 6mg per kg iron vs placebo	Fever	Iron vs control: 35 vs 32 febrile episodes per health worker	NR	NR	N/A	Baseline status: anaemic or iron deficient

Table A8.17 Zinc supplementation and zinc status

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Zinc supplementation and serum zinc levels										
	Mayo-Wilson et al (2014) AMSTAR 2 confidence rating: moderate									
Zinc supplementation and serum zinc levels	Subgroup analysis - age 1 to <5 years 22 estimates from 19 RCTs (4911)	1 to <5 years 2 of 19 studies in HIC	NR	Zinc supplementation vs no zinc	Serum zinc levels	SMD -0.75 [negative SMD favours intervention]	-0.81 to -0.69	NR	N/A	I^2=93% Fixed-effects model
Zinc supplementation and serum zinc levels	Between-subgroup analysis Co-intervention with iron (Fe) vs no Fe	Mainly children <5 years old % weighting in MA	NR	Zinc plus iron supplementation vs zinc only	Serum zinc levels	Co-intervention with FE: SMD -0.47 (-0.54 to -0.39) No FE:	NR	<0.0001	N/A	NR

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
		from studies in children aged 1 to 5 years NR				SMD -0.70 (-0.75 to -0.65)				
Zinc supplementation and risk of zinc deficiency										
	Mayo-Wilson et al (2014) AMSTAR 2 confidence rating: moderate									
Zinc supplementation and risk of zinc deficiency	Subgroup analysis - age 1 to <5 years 12 estimates from 10 RCTs (3761)	Age 1 to <5 years	NR	Zinc supplementation vs no zinc	Risk of zinc deficiency	RR 0.41	0.37 to 0.47	NR	N/A	I^2=90.6% Fixed-effects model
Zinc supplementation and risk of zinc deficiency	Between-subgroup analysis: zinc plus iron vs no zinc only	Mainly children <5 years old % weighti	NR	Zinc plus iron supplementation vs zinc only	Risk of zinc deficiency	Greater benefit in the subgroup not given iron (RR 0.37; 95%	NR	<0.0001	N/A	NR

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
		ng in MA from studies in children aged 1 to 5 years NR				CI 0.33 to 0.42) compared with group given iron (RR 0.62; 95% CI 0.55 to 0.69)				
Zinc supplementation and haemoglobin levels										
	Mayo-Wilson et al (2014) AMSTAR 2 confidence rating: moderate									
Zinc supplementation and haemoglobin levels	Subgroup analysis - age 1 to <5 years 14 estimates from 12 RCTs (2332)	Age 1 to <5 years	NR	Zinc supplementation vs no zinc	Haemoglobin levels	SMD -0.04	-0.12 to 0.04	0.36	N/A	I^2=62% Fixed effects
Zinc supplementation and serum or plasma ferritin concentration										
	Mayo-Wilson et al (2014) AMSTAR 2 confidence rating: moderate									

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Zinc supplementation and serum or plasma ferritin concentration	Subgroup analysis – age 1 to <5 years 11 estimates from 8 RCTs (2716)	Age 1 to <5 years	NR	Zinc supplementation vs no zinc	Serum or plasma ferritin	SMD 0.16	0.08 to 0.24	P=0	N/A	I^2=98% Fixed-effects model
Zinc supplementation and prevalence of anaemia										
	Mayo-Wilson et al (2014) AMSTAR 2 confidence rating: moderate									
Zinc supplementation and prevalence of anaemia	Subgroup analysis – age 1 to <5 years 8 estimates from 6 RCTs (2161)	Age 1 to <5 years	NR	Zinc supplementation vs no zinc	Prevalence of anaemia	RR 0.99	0.88 to 1.12	0.88	N/A	I^2=50% Asymmetrical funnel plot Fixed-effects model
Zinc supplementation and prevalence of iron deficiency (ID)										
	Mayo-Wilson et al (2014) AMSTAR 2 confidence rating: moderate									

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Zinc supplementation and ID	Subgroup analysis - age 1 to <5 years 11 estimates from 7 RCTs (1992)	Age 1 to <5 years	NR	Zinc supplementation vs no zinc	ID	RR 1.16	0.94 to 1.44	0.16	N/A	I^2=12.98% Fixed-effects model
Zinc supplementation and ID	Between-subgroup analysis: zinc plus iron vs no zinc only	Mainly children <5 years old % weighting in MA from studies in children aged 1 to 5 years NR	NR	Zinc plus iron supplementation vs zinc only	ID	No difference in effect between subgroups	N/A	0.48	N/A	I^2 NR

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Zinc supplementation and growth – height										
	Mayo-Wilson et al (2014) AMSTAR 2 confidence rating: moderate									
Zinc supplementation and height	Subgroup analysis - Age 1 to <5 years 27 estimates from 24 RCTs (6155)	Age 1 to <5 years	NR	Zinc supplementation vs no zinc	Height	SMD -0.09 [negative SMD favours intervention]	-0.14 to -0.04	P=0	N/A	Fixed effects I^2=42%
Zinc supplementation and height	Subgroup analysis - HIC 6 RCTs (284)	Mainly children <5 years old 56% weighting in subgroup MA from studies in children aged	NR	Zinc supplementation vs no zinc	Height	SMD -0.17	-0.40 to 0.06	0.14	N/A	I^2=45%

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
		1 to 5 years at baseline								
Zinc supplementation and height	Between-subgroup analysis: zinc plus iron vs no zinc only	Mainly children <5 years old % weighting in MA from studies in children aged 1 to 5 years NR	NR	Zinc plus iron supplementation vs zinc only	Height	Greater benefit in subgroup not given iron (SMD -0.12; 95% CI -0.16 to -0.08) vs no difference in the group given iron (SMD -0.01; 95% CI -0.08 to 0.07)	See previous column	0.01	N/A	None
Zinc supplementation and growth – weight										
	Mayo-Wilson et al (2014) AMSTAR 2 confidence rating: moderate									

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Zinc supplementation and weight	Subgroup analysis - Age 1 to <5 years 23 estimates from 20 RCTs (5565)	Age 1 to <5 years	NR	Zinc supplementation vs no zinc	Weight	SMD -0.06 [negative SMD favours intervention]	-0.11 to -0.01	0.03	N/A	I^2=43%; Fixed-effects
Zinc supplementation and weight	Subgroup analysis - HIC 5 RCT (271)	Mainly children <5 years old %60 weighting of subgroup MA from studies in children aged 1 to 5 years at	NR	Zinc supplementation vs no zinc	Weight	SMD -0.16 [negative SMD favours intervention]	-0.40 to 0.07	0.18	N/A	I^2=44.5%; Fixed-effects

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
		baseline								
Zinc supplementation and weight	Between-subgroup analysis: zinc plus iron vs no zinc only	Mainly children <5 years old % weighting in MA from studies in children aged 1 to 5 years NR	NR	Zinc plus iron supplementation vs zinc only	Weight	No difference in effect between subgroups	NR	0.22	N/A	None
Zinc supplementation and growth – weight for height										
	Mayo-Wilson et al (2014) AMSTAR 2 confidence rating: moderate									

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Zinc supplementation and growth – weight-to-height ratio	Subgroup analyses: - Age 1 to <5 years 14 estimates from 12 RCTs (4302)	Age 1 to <5 years	NR	Zinc supplementation vs no zinc	Weight-to-height	SMD -0.02	-0.08 to 0.05	0.62	N/A	I^2=6.8%; fixed effects Graded
Zinc supplementation and growth – weight-to-height ratio	Between-subgroup analysis - Fe vs no Fe	Mainly children <5 years old % weighting in MA from studies in children aged 1 to 5 years NR	NR	Zinc plus iron supplementation vs zinc only	Weight-to-height	No difference in effect between subgroups	NR	0.06	N/A	None

Micronutrients – vitamin A

Table A8.18 Vitamin A supplementation and vitamin A status

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Vitamin A supplementation and serum vitamin A										
	Imdad et al (2017) AMSTAR 2 confidence rating: high									
Vitamin A supplements and serum retinol level	MA of 15 RCTs (11,788) LIC, LMIC, UMIC	6 to 60 months	Longest follow-up (NR)	Vitamin A-supplements	Serum retinol levels	SMD 0.26	0.22 to 0.30	<0.001	N/A	I^2=95%; Fixed-effects
Vitamin A supplements and serum retinol level sensitivity analysis (test for small	MA of 14 RCTs LIC, LMIC, UMIC	6 to 60 months	Longest follow-up (NR)	Vitamin A-supplements	Serum retinol levels	SMD 0.50	0.30 to 0.70	NR	N/A	I^2=95%; Random-effects; The overall estimate was considerably larger

study bias)										than the fixed-effect estimate, suggesting small studies report larger effects Asymmetrical funnel plot
Vitamin A supplementation and vitamin A deficiency										
	Imdad et al (2017) AMSTAR 2 confidence rating: high									
Vitamin A supplements and vitamin A deficiency	MA of 4 RCTs (2262) LIC, LMIC, UMIC	6 to 60 months	24 months (At longest follow-up)	Vitamin A supplements	Vitamin A deficiency	RR 0.71	0.65 to 0.78	<0.0001	N/A	I^2=78%; Fixed-effects

Table A8.19 Vitamin A fortification and vitamin A status

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Vitamin A fortification and serum retinol										
	Eichler et al (2012) AMSTAR 2 confidence rating: low									
Vitamin A fortification and serum retinol	MA of 4 RCTs (NR)	6 months to 3 years (% weighting in children aged 1 to 5 years not reported)	NR	Vitamin A fortification (with other micronutrients)	Serum retinol concentration	MD: 3.7µg/dl	1.3 to 6.1µg/dl	NR	N/A	I^2=37%
	Das et al (2013) AMSTAR 2 confidence rating: critically low									

Vitamin A fortification and serum retinol	MA of 5 estimates from 3 RCTs (2362) UMIC and LMIC	48 to 72 months	More than 6 months	Vitamin A fortification Food vehicle: biscuits, monosodium glutamate, sugar, flour and seasoning.	Serum retinol concentration	SMD: 0.61	0.39 to 0.83	<0.0001	N/A	I^2=84%; random effects; 3 estimates from 1 study were in children aged 3 to 6 years (55.5% weighting of MA)
Vitamin A fortification and vitamin A deficiency										
	Das et al (2013) AMSTAR 2 confidence rating: critically low									
Vitamin A fortification and vitamin A deficiency	MA of 4 estimates from 2 RCTs (1465) UMIC and LMIC	48 to 72 months	More than 6 months	Vitamin A fortification Food vehicle: biscuits, monosodium glutamate, sugar, flour and seasoning.	Vitamin A deficiency	RR 0.39	0.09 to 1.74	0.22	N/A	Plasma (serum) retinol concentration of less than 20 µg/dl – adapted from WHO (Global prevalence of vitamin A deficiency in populations at risk 1995-2005); I^2=88%; random effects; 4 effect estimates from 2 RCTs of which 3 estimates from 1 study were in children aged 3 to 6 years (70.9%

										weighting of MA)

Table A8.20 Vitamin A supplementation and ophthalmological outcomes

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Vitamin A supplementation and Bitot's spots										
	Imdad et al (2017) AMSTAR 2 confidence rating: high									
Vitamin A supplements and Bitot's spots	1 RCT (NR) LIC	9 to 72 months	Every 6 months for 18 months	Vitamin A supplements	Incidence of Bitot's sports	No effect: RR 0.93	0.76 to 1.14	NR	N/A	I^2=N/A Fixed-effects
Vitamin A supplements and Bitot's spots	MA of 5 RCTs (1,063,278) LIC, LMIC, UMIC	6 to 60 months	At longest follow-up (<1 year since randomisation)	Vitamin A supplements	Prevalence of Bitot's sports	RR 0.42	0.33 to 0.53	<0.0001	N/A	I^2=49%; Fixed-effects
Vitamin A supplementation and night blindness										
	Imdad et al (2017) AMSTAR 2 confidence rating: high									

Vitamin A supplements and night blindness	1 RCT (NR) LIC	9 to 72 months	Every 6 months for 18 months	Vitamin A supplements	Incidence of night blindness	RR 0.53	0.28 to 0.99	NR	N/A	I^2=N/A; Fixed effects
Vitamin A supplements and night blindness	MA of 2 RCTs (22,972) UMIC	0 to 5 years	16 months (At longest follow-up)	Vitamin A supplements	Prevalence of night blindness	RR 0.32	0.21 to 0.50	NR	N/A	I^2=0%; Fixed effects
Vitamin A supplementation and xerophthalmia										
	Imdad et al (2017) AMSTAR 2 confidence rating: high									
Vitamin A supplements and xerophthalmia incidence	MA of 3 RCTs (NR) LIC, LMIC, UMIC	0 to 72 months	18 months (At longest follow-up)	Vitamin A supplements	Incidence of Xerophthalmia	No effect: RR 0.85	0.70 to 1.03	0.11	N/A	I^2=63%; fixed effects
Vitamin A supplements and xerophthalmia prevalence	MA of 2 RCTs (22,972) UMIC and LMIC	6 to 60 months	16 months (At longest follow-up)	Vitamin A supplements	Prevalence of Xerophthalmia	RR 0.31	0.22 to 0.45	<0.0001	N/A	I^2=0%; fixed effects

Table A8.21 Vitamin A fortification and haemoglobin

Exposure and outcome	Study type (n participants) country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Vitamin A fortification and haemoglobin (Hb)										
	Das et al (2013) AMSTAR 2 confidence rating: critically low									
Vitamin A fortification and Hb	MA of 4 estimates from 2 RCTs (1538) UMIC and LMIC	48 to 72 months	More than 6 months	Vitamin A fortification Food vehicle: biscuits, monosodium glutamate, sugar, flour and seasoning.	Hb levels	SMD: 0.48	0.07 to 0.89	0.02	N/A	I^2=93%; random effects; 4 effect estimates from 2 RCTs of which 3 estimates from 1 study were in children aged 3-6 years (73.5% weighting of MA)

Table A8.22 Vitamin A supplementation and growth

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Vitamin A supplementation and growth										
	Ramakrishnan et al (2009) AMSTAR 2 confidence rating: critically low									
Vitamin A supplements and change in height	MA of 17 estimates from 14 RCTs (69,320)	Mostly 1 to 5 years	NR	Vitamin A supplements	Change in height	Cohen's effect size: 0.08	-0.18 to 0.34	NR	N/A	Heterogeneity p<0.05; random -effects 11 of 17 data sets had positive effect sizes for change in height in favour of vit A; the overall weighted mean effect size was small and was not statistically significant;

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
										stratified analyses did not find any differences by age, duration, or baseline nutritional status
Vitamin A supplements and change in weight	MA. Number of estimates, RCTs or participant NR	1 to 5 years	NR	Vitamin A supplements	Change in weight	Cohen's effect size: -0.03	-0.23 to 0.18	NR	N/A	Heterogeneity p<0.01; random-effects stratified analyses did not find any differences by age, duration of follow-up
Vitamin A supplements and change in	MA of 5 RCTs (NR)	1 to 5 years	NR	Vitamin A supplements	Change in WHZ	Cohen's effect size: 0.01	-0.06 to 0.09	NR	N/A	Heterogeneity NR; random effects

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
weight-for-height z-score (WHZ)										

Micronutrients – vitamin D

Table A8.23 Vitamin D fortification

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Vitamin D fortification and serum vitamin D										
	Hojsak et al (2018) AMSTAR 2 confidence rating: critically low									
Vitamin D fortification and vitamin D status	1 RCT (Akkermans et al 2017) (318) Germany, the Netherlands, UK	1 to 3 years	20 weeks	Formula milk fortified with 1.7µg per 100ml of vitamin D (and 1.2mg per 100ml iron) versus unfortified cows' milk	Serum vitamin D	Fortified milk increased serum vitamin D and decreased the risk of vitamin D deficiency (serum 25(OH)D <50nmol/l) compared with unfortified milk (quantitative details	NR	NR	N/A	Study was funded by Danone Nutricia Research Baseline status mean (SD)* Intervention group: 69.4nmol/l (27.0) Control group: 70.2nmol/l (26.7)

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						not reported)				Intention-to-treat analyses
Vitamin D fortification and vitamin D status	1 RCT (Houghton et al 2011) (225) New Zealand	12 to 20 months	20 weeks	Vitamin D-fortified cows' milk vs vitamin D-fortified formula vs red meat	Serum vitamin D	Vitamin D-fortified cows' milk or formula significantly reduced the proportion of children with vitamin D deficiency (25(OH)D <50nmol/l) compared with intake of red meat	NR	NR	N/A	Baseline status (mean, 95% CI)* All children: 52.3nmol/l (48.9 to 55.9nmol/l) Intervention group: 52.8nmol/l (48.1 to 57.4) Type of analysis not reported

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						(quantitative data not reported)				
Vitamin D fortification and vitamin D status	1 RCT (Hower et al 2013) (92) Germany	2 to 6 years	Approximately 6 months (during winter months) *	Daily consumption of vitamin D-fortified formula (2.85µg per 100ml) vs non-fortified semi-skimmed cows' milk	Serum vitamin D	Daily consumption of fortified formula contributed to the prevention of an otherwise frequently observed decrease in serum vitamin D concentration during winter	NR	NR	N/A	Study funded by HiPP GmbH and Co. Baseline status before winter (median, range)* Intervention group: median 21.5 ng/ml (10.1 to 43.0 ng/ml)

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						(quantitative data not reported)				Control group: median 18.4 ng/ml (11.0 to 44.9 ng/ml) Per protocol analysis

Table A8.24 Vegetables and fruit consumption

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	SR Ledoux et al (2011) AMSTAR 2 confidence rating: critically low									
Vegetables and fruit and body weight	PCS (Newby et al, 2003) (1379) USA	2 to 5 years	6 to 12 months	Number of vegetables and fruit servings (classification of vegetables and fruit not reported)	Weight change (kg) (at baseline, 18% of girls and 23% of boys were overweight or obese)	0.09kg per year per each additional serving of vegetables	0.05 to 0.13	0.02	Age, sex, SES and ethnicity did not adjust for baseline weight.	None
Vegetables and fruit and BMI z-score	PCS (Faith et al, 2006) (971) USA (low income)	1 to 5 years	up to 2 years	Vegetables and fruit intake (did not include juice, carrots, potatoes and salads)	Adiposity assessed by BMI z-score	No association (estimate NR)	NR	NR	SES and ethnicity	None

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Fruit juice consumption										
	Frantsve-Hawley et al (2017) AMSTAR 2 confidence rating: moderate									
Fruit juice consumption and change in BMI	PCS (Faith et al 2006) (825) USA	1 to 4 years	Measured every 6 months, up to 48 months (4 years)	Fruit juice (servings per day)*	BMI, BMI z-score	Each additional serving per day associated with BMI z-score increase of 0.005 (SE 0.002)	NR	<0.01	Baseline BMI-z score, sex, ethnicity, consumption of potatoes, vegetables, fruits, milk, parental feeding behaviours	Children from low income families
Fruit juice consumption and change in BMI	PCS (Guerrero, 2016) (15,418) USA	48 months (4 years)	2 years	Any vs no fruit juice	BMI	Change in BMI from age 4 to 6 years with any vs no SSB consumption: -0.101 (SE 0.053)	NR	>0.05	Age, sex, ethnicity, birthweight, number of parents in household, poverty status, maternal education, breastfeeding, consumption of fast food,	None

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									fruits and vegetables	
Fruit juice consumption and change in BMI	PCS (Newby, 2004) (1345) USA	2 to 5 years	6 months	Fruit juice (ounce per day)	BMI	Each additional ounce per day of fruit juice associated with 0.01 (SE 0.00) change in BMI	NR	0.20	Total energy consumption, baseline BMI, age, sex, SES, maternal education, birth weight	None
Fruit juice and change in BMI z-score	PCS (Shefferley et al 2016) (8950) USA	2, 4, 5 years	2 and 3 years	Fruit juice (≥1 serving per day vs <1 serving per day)	BMI z-score	0.030 (SE 0.037) change in BMIz (between age 2 and 4*) with <1 serving per day (at age 2*) compared with 0.282 (SE 0.028)	NR	0.0003	Sex, ethnicity, SES, maternal BMI, baseline BMI z-score	None

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						change in BMIz with ≥1 serving per day				
Fruit juice and BMI z-score	PCS (Skinner et al, 1999) (105) USA	24, 28 and 32m	4 months	≥12 oz juice vs <12 oz juice	BMI	BMI of children who consumed <12 oz juice: BMI 16.3kg/m^2 BMI of children ≥12 oz juice: BMI 16.4kg/m^2	NR	0.42	Age, sex, maternal height and BMI	Same cohort as Skinner et al 2001 – these results have not been reported in the draft report
Fruit juice and change in BMI z-score	PCS (Skinner et al, 2001) (72) USA	24, 28, 32, 36m	4 years	Fruit juice (oz per day)	BMI	For each additional oz per day of fruit juice, BMI decreased by 0.057	NR	0.99	Baseline BMI and height, sex, total energy consumption, parental height or BMI	Same cohort as Skinner et al 1999

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Fruit juice consumption and change in BMI	PCS (Sonneville et al, 2015) (1163) USA	1 year	6 years	Fruit juice consumption (oz per day) compared with non-consumers	BMI	When compared with no juice consumption: (1) mean change in BMI (Beta coefficient; 95% CI) not adjusted for total energy 0.08 (-0.05 to 0.20) for 1 to 7 oz per day 0.23 (0.07 to 0.39) for 8 to 15 oz per day	See previous column	(1) 0.01 (2) 0.05	Age, sex, ethnicity, baseline WHZ, water intake, maternal age, education, pre-pregnancy BMI, household income	Evidence of dose-response association

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						0.36 (0.08 to 0.64) for ≥16 oz per day (2) mean change in BMI (Beta coefficient; 95% CI) after adjusting for total energy 0.07 (-0.06 to 0.21) for 1 to 7 oz per day 0.23 (0.05 to 0.40) for 8 to 15 oz per day 0.27 (-0.05 to 0.59) for				

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						≥16 oz per day				
Fruit juice consumption and odds of incident obesity	PCS (Welsh et al, 2005) (10,904) USA	2 to 3 years	1 year	Fruit juice >1 servings per day vs <1 serving per day	BMI	When compared with <1 serving per day OR of incident obesity (95% CI) among children with normal weight at baseline OR 1.1 (0.8 to 1.5) for 1 to <2 servings per day	See previous column	NS (p-value NR)	Baseline BMI, age, sex, ethnicity, birthweight, total energy intake, intake of HFSS foods	None

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						OR 1.0 (0.7 to 1.4) for 2 to <3 servings per day OR 1.2 (0.8 to 1.7) for ≥3 servings per day				

Table A8.25 Milk and dairy consumption

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total dairy consumption										
	Dror and Allen (2014) AMSTAR 2 confidence rating: critically low									
Total dairy consumption and linear growth	PCS (Rangan et al, 2012) (335) Australia	1.5 years	Age 8 years	Quintiles of dairy consumption (energy adjusted)	Change in height (cm)	No association (estimate NR)	NR	NR	The analysis was adjusted for child's age, sex, Socio-Economic Index for Areas score and baseline weight status (weight-for-length z-score at 18 months), maternal and paternal education level, maternal and paternal countries of birth, maternal age at birth, maternal smoking status during pregnancy,	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									gestational diabetes, breastfeeding, CAPS randomisation group (diet, active or control, and dust mites, active or control), total energy intake, fruit intake and vegetable intake.*	
	Dougkas et al (2019) AMSTAR 2 confidence rating: low									
Total dairy consumption and body fat (%)	PCS (Carruth and Skinner, 2001) (53) USA	2 years	6 years	Total dairy product consumption (*servings per day) (*higher intake versus lower intake of dairy products)	% body fat	Higher average dairy product intake over the years was associated with lower % body fat	SE 1.04	0.001	Sex, BMI, calcium, protein, carbohydrates and fat intakes	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						(Beta coefficient -3.54)				
Total dairy consumption and body fat (g)	PCS (Carruth and Skinner, 2001) (53) USA	2 years	6 years	Total dairy product consumption (*servings per day) (*higher intake versus lower intake of dairy products)	Body fat (g)	Higher average dairy product intake over the years was associated with lower body fat (g) (Beta coefficient -907.06)	SE 284.06	0.003	Sex, BMI, calcium, protein, carbohydrates and fat intakes	None
Total dairy consumption and body fat (mm)	PCS (Moore et al, 2006) (92) USA	3 to 6 years	8 years	Total dairy product consumption (low (<1.75 servings per day) compared	Subcutaneous fat (mm)	Greater subcutaneous fat (25mm)	NR	0.005	Age, physical activity, maternal education, baseline anthropometry, saturated fat	Date of the reference for the primary study (Moore et al 2006)

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				with high intake)					intake, energy intake	in SR evidence tables is different than the in the references of the SR (Moore et al 2008). The characteristics of the primary study and the results are different from the detail extracted by the SR

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total dairy consumption and BMI	PCS (Moore et al, 2006) (92) USA	3 to 6 years	8 years	Total dairy product consumption (low (<1.75 servings per day) compared with high intake)	BMI	Higher BMI (2 units)	NR	0.046	Age, physical activity, maternal education, baseline anthropometry, saturated fat intake, energy intake	Date of the reference for the primary study (Moore et al 2006) in SR evidence tables is different than the in the references of the SR (Moore et al 2008). The characteristics of the primary study and the results

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
										are different from the detail extracted by the SR
Total dairy consumption and BMI	PCS (Garden et al, 2011) (362) Australia	18 months	Age 8 years	Consumption of dairy products measured as % total energy (compared with protein, meat and fruit consumption)	BMI	High consumption of dairy products was associated with lower BMI (β -0.21)	0.41 to 0.01	0.04	Sex, birth weight, breastfeeding for 6 months, parental obesity status, ethnicity, smoking in pregnancy, paternal education and asthma study intervention group	The PCS used a dataset from The Childhood Asthma Prevention Study (CASP)
Total dairy consumption and BMI	PCS (Rangan et al, 2012) (335) Australia	18 months	Age 8 years	Quartiles of energy adjusted dairy product consumption (high vs low quartiles)	BMI	NR (no association)	NR	0.09	Unadjusted (adjusted analysis NR)	The PCS used a dataset from the CASP cohort
Milk consumption										

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Dougkas et al (2019) AMSTAR 2 confidence rating: low									
Milk consumption and body fat (%)	PCS (Hasnain et al, 2014) (103) USA	3 to 5 years	12 years	Milk consumption (tertiles) highest tertile (411ml per day) compared with the lowest tertile (115ml per day)	% body fat	Mean difference -7.3%	NR	0.0095	Age, baseline anthropometry, *% energy intake from fat, television viewing, beverage intake, maternal BMI and education	None
Milk consumption and BMI z-score	PCS (Faith et al, 2006) (971) Australia	1 to 5 years	4 years	Milk consumption	BMI z-score	Beta coefficient -0.002 no association	SE 0.002	0.39	Baseline child's weight-for-height z score, sex, ethnicity, children's food and beverage intake (not clear if baseline), parental feeding styles and attitude variables	None
Milk consumption	PCS (Newby et al, 2004)	2 to 5 years	8 months	Milk consumption	Annual change	Beta coefficient 0.00	SE 0.01	0.84	Age, sex, birth weight, energy intake (not clear	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
and BMI z-score	(1345) USA				BMI z-score	(no association)popu			if baseline), sociodemographic variables, height change	
Milk consumption and BMI z-score	PCS (De Boer et al, 2014) (8950) NR	4 years	1 year	Milk consumption	BMI z-score	NR (no association)	NR	0.79	Sex, ethnicity, socioeconomic status and milk type	None
Milk consumption and overweight	PCS (Huh et al, 2010) (852) USA	2 years	1 year	Milk consumption (whole or reduced fat)	Incident overweight (*defined as BMI for age and sex ≥ 85th %ile)	NR (no association)	NR	>0.05	Age, sex, ethnicity, baseline BMI z score, baseline energy intake and non-dairy beverage intake, television viewing, maternal BMI and education, paternal BMI	None
Milk consumption	PCS (Huh et al, 2010) (852) USA	2 years	1 year	Milk consumption (whole or reduced fat)	BMI z-score	NR (no association)	NR	>0.05	Age, sex, ethnicity, baseline BMI z score, baseline	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
and BMI z-score									energy intake and non-dairy beverage intake, television viewing, maternal BMI and education, paternal BMI	
Full-fat milk consumption and BMI z-score	PCS (Huh et al, 2010) (852) USA	2 years	1 year	Full-fat milk consumption	BMI z-score	Beta coefficient -0.09 full-fat milk intake at 2 years was associated with a decrease in BMI z-score at age 3 years	0.16 to -0.01	0.02	Age, sex, ethnicity, baseline BMI z score, baseline energy intake and non-dairy beverage intake, television viewing, maternal BMI and education, paternal BMI	None
Reduced-fat milk consumption	PCS (Huh et al, 2010) (852) USA	2 years	1 year	Reduced fat milk consumption	BMI z-score	NR (no association)	NR	NR	Age, sex, ethnicity, baseline BMI z score, baseline energy intake	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
and BMI z-score									and non-dairy beverage intake, television viewing, maternal BMI and education, paternal BMI	
Milk consumption and BMI z-score	PCS (Scharf et al, 2013) (8300) USA	2 years and 4 years	2 years	Full-fat or reduced-fat milk consumption	Change in BMI z-score	No difference in change in BMI z-scores from ages 2 to 4 years between groups*	NR	0.6	Sex, ethnicity and SES	None
Skimmed or 1% milk consumption and BMI z-score	PCS (Scharf et al, 2013) (8300) USA	2 years and 4 years	2 years	Skimmed or 1% milk consumption (comparison NR)	Change in BMI z-score	OR 1.57 of becoming overweight or obese between ages 2 and 4 years	1.03 to 2.42	p<0.05	Sex, ethnicity and SES	Children with ‘normal’ weight at baseline
Consumption of other dairy products										

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	de Beer (2012) AMSTAR 2 confidence rating: critically low									
Yoghurt consumption and linear growth	RCT (He at al, 2005) (402) China	Mean age 3.3 years	9 months	Intervention: 125g of yoghurt 5 days a week Control: no intervention	Change in height (cm)	Mean difference +0.19cm 5.43cm (SD 0.69) vs 5.24cm (SD 0.76)	0.0481 to 0.3319	p<0.05	N/A	None
	Dougkas et al (2019) AMSTAR 2 confidence rating: low									
Cheese and cream or crème fraiche consumption and overweight or obesity	PCS (Huus et al, 2009) (14,224) Sweden	2.5 years	2.5 years	Consumption of cheese, cream or crème fraiche	Overweight or obesity	Higher cheese intake and lower cream or crème fraiche intake was associated with overweight or obesity	NR	NR	Mother's education and BMI, father's education and BMI, heredity of diabetes, dietary intakes of vegetables, potatoes, fried potatoes, eggs, sausage, chocolate, candies, porridge	None
Total dairy consumption and bone health										
	Dror and Allen (2014) AMSTAR 2 confidence rating: critically low									

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Total dairy consumption and bone mineral content (g) and bone area (cm)	PCS (Moore et al, 2008) (106) USA	3 to 5 years	Age 15 to 17 years	Dairy consumption	(a) Total body bone mineral content (g) (b) Bone area (cm)	Two or more servings of dairy per day associated with higher total body bone mineral content (g) and bone area compared to less than 2 servings of dairy per day	NR	(a) 0.009 (b) 0.02	Sex, physical activity, age, height, BMI, activity, and percent body fat (from DXA) at the time of bone scan	None
Blood pressure (BP)										
Total dairy consumption and systolic BP and	PCS (Rangan et al, 2012) (335) Australia	1.5 years	Age 8 years	Quintiles of energy adjusted dairy intake	Systolic BP Diastolic BP	Children in the higher quintile at age 1.5 years had lower systolic	NR	<0.05 (for both outcomes)	Age, sex, SES, baseline weight status, maternal smoking status during pregnancy, maternal and	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
diastolic BP						and diastolic BP at age 8 years			paternal countries of birth and education level, gestational diabetes, breastfeeding, energy intake, vegetables and fruit intake	
Total dairy consumption and systolic BP and diastolic BP	PCS (Moore et al, 2005) (95) USA	3 to 6 years	Age 13 years	Servings per day of dairy >2 servings per day vs <2 servings per day	(a) Systolic BP (annual gains) (b) Diastolic blood pressure (annual gains)	(a) Children consuming >2 servings per day of dairy at ages 3 to 6 years had smaller annual gains in systolic BP from ages 3 to 13 years	NR	NR	Child's baseline blood pressure, mean activity counts per hour, intake of magnesium and sodium per day at age 3 to 6 years, vegetables and fruit intake and change in child's BMI from 3 to 12 years	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						Beta coefficient 2.90 (SE 0.18) vs Beta coefficient 2.21 (SE 0.24) (b) No difference between groups (estimate NR)				
Total dairy consumption and cognitive ability										
	Tandon et al (2016) AMSTAR 2 confidence rating: critically low									
Total dairy consumption and verbal Cognitive outcomes	PCS (Nyaradi et al, 20013) (1346)	1 to 3 years	age 10 years	Dairy consumption	Verbal cognitive outcomes	Dairy consumption at ages 2 and 3 was associated with better verbal cognitive outcomes	NR	NR	Sex, maternal age, maternal education, family income, father living with family, reading to the child, maternal Bradburn Negative Affect	None

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						at age 10 years			score (maternal mental health distress) and breastfeeding.	

Table A8.26 Breastfeeding beyond first year of life

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Growth										
	Delgado and Matijasevich (2013) AMSTAR 2 confidence rating: critically low									
Breastfeeding and weight	PCS (Fawzi et al, 1998) (28,753) Sudan	Children age <36 months (*mean baseline age NR)	Age 24 to 35.9 months	Breastfeeding ≥2 years	Weight (g)	Total: MD: -205g Affluent households: MD: -38g Low maternal education: MD: -133g Higher level of maternal education: MD: -88g	Total: -279 to -131 Affluent households: -106 to 30 Low maternal education: -193 to -74 Higher level of maternal education: -179 to 4	NR	Child age, sex, dietary vitamin A intake, morbidity, household wealth, availability of water in the house, maternal literacy. The relationship between continued breastfeeding and nutritional status was mediated by SES	The analyses included children of normal and low nutritional status (wasting or stunting).

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									(household wealth) and maternal education.	
Breastfeeding and linear growth	PCS (Simondon et al, 2001) (443) Senegal	13 months	Age 39 months (follow up every 6 months)	Breastfeeding for ≥2 years	Height or length (cm)	Children (aged 21 to 25.9 months) who were breastfed for ≥2 years had higher growth over the following 6 months than children who had stopped breastfeeding at the	SD 0.3	<0.05	Season (wet or dry), quality of housing, initial age and weight.	Housing quality was a key modifier. Children from poor housing breastfed ≥2 years grew more than children from poor housing who were no longer breastfed while the opposite was true for children from good housing.

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						beginning of the 6-month interval MD: 0.7cm				
Cognitive development										
	Delgado and Matijasevich (2013) AMSTAR 2 confidence rating: critically low									
Breastfeeding and cognitive development	PCS (Daniels and Adair, 2005) (1979) Philippines	From birth	Ages 8.5 years and 11.5 years	Breastfeeding for ≥2 years compared with breastfeeding for 0<6 months	Cognitive ability score at (a) age 8.5 years (b) age 11.5 years	(a) No association between breastfeeding duration and cognitive ability score at age 8.5 years Breastfeeding for ≥2 years	NR	(b) Not performed or reported (b) 0.446	Parental education, paternal presence in home, maternal age, parity, alcohol use during pregnancy, preterm status of child, maternal literacy, child's gender,	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						(49.4; SD 13.4) versus breastfeeding for 0 to <6 months (53.7; SD 13.4) (b) No association between breastfeeding duration and cognitive ability score at age 11.5 years (NR)			number of baths taken per week, dietary variety at age 2 years, household income, non-income-producing assets, electricity in the home, and environmental hygiene score	
Breastfeeding and	PCS (Duazo et al, 2010)	NR	Up to age 5 to 6 years	Breastfeeding for ≥2 years	Psychosocial developmen	No association on	Breastfeeding for ≥2 years	>0.1	Sex, day-care attendance	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
psychosocial development	(2752) Philippines			compared with breastfeeding for 0<6 months	t score at age 5 and 6	breastfeeding for ≥2 years 1.54 (Psychological development score) breastfeeding for <6 months 1.62 (psychological development score)	20.49 to 3.57 breastfeeding for <6 months 20.75 to 3.99		, maternal education, father's presence in the home, hygiene and non-income-producing assets	

Dietary patterns

Table A8.27 Diet quality

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	SR Costa et al (2018) AMSTAR 2 confidence rating: moderate									
'Unhealthy' dietary pattern and body fat (kg)	PCS (Wosje et al, 2010) (292) USA	3.8 to 4.8 years	Measurements at age ranges: >4.8–5.8, >5.8–6.8 and >6.8–7.8 years; follow-up every 4 months	A dietary pattern consisting of higher intakes of non-wholegrains, cheese, processed meats, eggs, fried potatoes, discretionary fats and artificially-	Body fat (kg measured by DXA)	Participants in the highest quartile for processed food consumption had higher fat mass than quartiles 1 and 2and3 across all age ranges	NR	NR	Child's score for 'healthy' dietary pattern, sex, height, exact age, total energy intake, calcium intake, accelerometer counts per minute, TV viewing time, outdoor playtime,	Dietary pattern 'that contained mostly ultraprocessed foods' identified by reduced rank regression

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				sweetened beverages					other dietary pattern scores	
‘Unhealthy’ dietary pattern and body fat (%)	PCS (Alexy et al 2011) (585) Germany	3 years	Until age 18 years	Convenience food consumption (*% total food intake) (Convenience foods included pre-baked frozen products, canned or instantaneous products such as salads or	Body fat % (triceps and subscapular skinfolds)	Girls: no association (Beta coefficient 0.012) Boys: higher convenience food consumption at baseline significantly predicted change in body fat % (Beta coefficient 0.104)	Girls: NR Boys: NR	Girls: 0.6953 Boys: 0.0098	Age, residual energy, maternal BMI, maternal education and physical activity	Study sample included 296 boys and 290 girls but only 196 boys and 170 girls were included in the longitudinal analysis * Did not include convenience food consumed in communal feeding environments (for example,

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				soups, or ready-to-eat meals like pizza)						day-care centres and schools), as the authors intended to focus on the special eating situation within the family, which is mainly responsible for the development of dietary habits
'Unhealthy' dietary pattern and body fat (kg)	PCS (Leary et al, 2015) (4,750) UK	38 months	Until age 15 years	'Junk food' dietary pattern (including fizzy drinks, sweets and	Body fat (kg measured by DXA)	A higher junk food dietary pattern score at 38 months was associate	0.02 to 0.10	0.002	Sex and age at the time of body composition measurement, total energy	Dietary pattern identified through Principal Component Analysis

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				confectionary, fried foods, sausages, burgers, crisps)		d with an increase in body fat at age 15 years (Beta coefficient 0.06)			intake at 38 months for the four dietary patterns, parental factors (maternal and paternal height and BMI, maternal age and parity), social factors (social class, maternal education), birth weight, gestational age,	

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									pubertal status, stratified by sex	
	SR Tandon et al (2016) AMSTAR 2 confidence rating: critically low									
Diet quality and receptive vocabulary	PCS (Nyaradi et al, 2013) (1346) Australia	Exposure assessed at age 1, 2 and 3 years	Outcome assessed at 10 years of age	Eating Assessment in Toddlers (EAT) diet scores	Receptive vocabulary measured by Peabody Picture Vocabulary test (PPVT III)	A higher EAT score at age 1 year was associated with higher PPVT III	NR	NR	Gender, maternal age, maternal education, family income, father living with family, reading to the child, maternal Bradburn Negative Affect score (maternal mental health	EAT diet scores based on Dietary Guidelines for Children and Adolescents in Australia. A higher score represented more eating occasions of foods from the categories of wholegrain, vegetables, fruits, meat ratio and dairy.

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									distress) and breastfeeding	
Diet quality and non-verbal cognitive ability	PCS (Nyaradi et al, 2013) (1346) Australia	Exposure assessed at age 1, 2 and 3 years	Outcome assessed at 10 years of age	Eating Assessment in Toddlers (EAT) diet scores	Nonverbal cognitive ability	A higher EAT score at age 1 year was associated with non-verbal cognitive ability	NR	NR	Gender, maternal age, maternal education, family income, father living with family, reading to the child, maternal Bradburn Negative Affect score (maternal mental health distress)	EAT diet scores based on Dietary Guidelines for Children and Adolescents in Australia. A higher score represented more eating occasions of foods from the categories of wholegrain, vegetables, fruits, meat ratio and dairy.

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									and breastfeeding	
‘Unhealthy’ dietary pattern and Key Stage 2 (KS2)	PCS (Feinstein et al, 2008) (5741) England	Exposure assessed at 38, 54 and 81 months	Outcome assessed between age 10 and 11 years	‘Junk food’ dietary pattern *characterised by high-fat processed foods (sausages, burgers and poultry products), snack foods high in fat or sugar (crisps, sweets, chocolate, ice	Key Stage 2 (KS2)	At age 38 months was associated with lower results on Key Stage 2 (estimate NR)	NR	NR	Gender, ethnicity, birth order, various socioeconomic measures and mother’s behaviours, breastfeeding, watching children’s programmes, HOME score (indicator of cognitive stimulation	Multiple measures of SES and mother’s behaviours which is a possible source of multicollinearity as all the variables are highly correlated to each other and were included in the same regression model. This can result in an unstable estimate

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				lollies and ice creams) fizzy drinks and the number of takeaway meals eaten per month					and emotional warmth in the home environment)	(large standard error) – they did not investigate for multicollinearity in the model]
‘Healthy’ dietary pattern and KS2	PCS (Feinstein et al, 2008) (5741) England	Exposure assessed at 38, 54 and 81 months	Outcome assessed between age 10 and 11 years	‘Health conscious’ dietary pattern *characterised as vegetarian foods, nuts, salad, rice, pasta, fruit,	KS2	At age 38 months was not associated with KS2 results	NR	NR	Gender, ethnicity, birth order, various socioeconomic measures and mother’s behaviours, breastfeeding,	Multiple measures of SES and mother’s behaviours which is a possible source of multicollinearity as all the variables are highly correlated to

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				cheese, fish, cereal, water and fruit juice					watching children's programmes, HOME score (indicator of cognitive stimulation and emotional warmth in the home environment)	each other and were included in the same regression model. This can result in an unstable estimate (large standard error) – they did not investigate for multicollinearity in the model]
'Healthy' dietary pattern and Intelligence	PCS (Smithers et al, 2013) (7652) England	Exposure assessed at 6, 15 and 24	Outcome assessed at 8 and 15 years of age	'Healthy' dietary pattern (characterised by breastfeeding at 6	IQ	Was weakly associated with higher IQ at age 8 years	NR	NR	Maternal age, maternal education, social class, marital	This PCS used a dataset from the Avon Longitudinal Study of Parents and

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
quotient (IQ)		months		months, raw vegetables and fruit, cheese and herbs		(but not 15 years)			status, maternal tobacco smoking during pregnancy, parity, family income, ethnicity, the number of children (<16 years old) living in the family home, stimulation in the home environment, duration of breastfeedi	Children (ALSPAC).

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									ng and other dietary trajectories	
'Unhealthy' dietary pattern and IQ	PCS (Smithers et al, 2013) (7652) England	Exposure assessed at 6, 15 and 24 months	Outcome assessed at 8 and 15 years of age	Discretionary' (characterised by foods such as biscuits, sweets and crisps)	IQ	Associated with lower IQ at age 15 years (but not 8 years)	NR	NR	Maternal age, maternal education, social class, marital status, maternal tobacco smoking during pregnancy, parity, family income, ethnicity, the number of children (<16 years	This PCS used a dataset from the Avon Longitudinal Study of Parents and Children (ALSPAC).

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									old) living in the family home, stimulation in the home environment, duration of breastfeeding and other dietary trajectories	
'Healthy' dietary pattern and IQ	PCS (Smithers et al 2012) (1366) England	Exposure assessed at 6, 15 and 24 months	Outcome assessed at 8 years of age	'Nutrient-dense' dietary patterns (*Not specified in the SR and in the primary	Full Scale Intelligence Quotient (FSIQ)	In early life (age not specified) associated with increase in FSIQ	NR	NR	Maternal age, education, social class, marital status, tobacco, smoking, family	This PCS used a dataset from ALSPAC.

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				study none of the patterns are described as 'nutrient dense')					income, parity, ethnicity, number of children (<16 years old) living in the family home and dietary pattern scores at younger ages.	
'Healthy' dietary pattern and Verbal IQ	PCS (Smithers et al 2012) (1366) England	Exposure assessed at 6, 15 and 24 months	Outcome assessed at 8 years of age	'Nutrient-dense' dietary patterns (*Not specified in the SR and in the primary	Verbal Intelligence Quotient (VIQ)	In early life (age not specified) associated with increased VIQ	NR	NR	Maternal age, education, social class, marital status, tobacco, smoking, family	This PCS used a dataset from ALSPAC.

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				study none of the patterns are described as 'nutrient dense')					income, parity, ethnicity, number of children (<16 years old) living in the family home and dietary pattern scores at younger ages.	
'Unhealthy' dietary pattern and IQ	PCS (Smithers et al 2012) (1366) England	Exposure assessed at 6, 15 and 24 months	Outcome assessed at 8 years of age	'Discretionary' dietary patterns (characterised by foods such as biscuits, sweets	Full Scale Intelligence Quotient (FSIQ)	In early life (age not specified) associated with decreases in FSIQ	NR	NR	Maternal age, education, social class, marital status, tobacco, smoking, family	This PCS used a dataset from ALSPAC.

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				and crisps)					income, parity, ethnicity, number of children (<16 years old) living in the family home and dietary pattern scores at younger ages.	
‘Unhealthy’ dietary pattern and Verbal IQ	PCS (Smithers et al 2012) (1366) England	Exposure assessed at 6, 15 and 24 months	Outcome assessed at 8 years of age	‘Discretionary’ dietary patterns (characterised by foods such as biscuits, sweets	Verbal Intelligence Quotient (VIQ)	In early life (age not specified) associated with decreases in VIQ	NR	NR	Maternal age, education, social class, marital status, tobacco, smoking, family	This PCS used a dataset from ALSPAC.

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				and crisps)					income, parity, ethnicity, number of children (<16 years old) living in the family home and dietary pattern scores at younger ages.	
‘Unhealthy’ dietary pattern and IQ	PCS (Northstone et al, 2012) (3966) England	Exposure assessed at 3 and 4 years,	Outcome assessed at age 8.5	‘Processed food’ dietary pattern (foods with high fat and sugars content and by	IQ assessed using Wechsler Intelligence Scale for Children (WISC) Version III	At age 3 was associated with a decrease in IQ at age 8.5 years	NR	NR	Age at WISC testing and WISC administrator, dietary pattern scores at that time point,	*Dietary patterns obtained via principal component analysis (PCA)

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				processed and convenience foods)					breastfeeding duration, energy intake, maternal education, maternal social class, maternal age, housing tenure, life events, HOME score and all other dietary pattern scores	

Table A8.28 Other dietary patterns

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
‘Ready-to-eat’ or ‘freshly cooked’ dietary patterns										
	SR Tandon et al (2016) AMSTAR 2 confidence rating: critically low									
‘Ready-to-eat’ dietary pattern and IQ	PCS (Smithers et al, 2013) (7652) England	Exposure assessed at 6, 15 and 24 months	Outcome assessed at 8 and 15 years of age	‘Ready-to-eat’ pattern (*characterised by commercially manufactured foods for infants at 6 and 15 months and biscuits, bread and breakfast cereals at 24 months)	IQ	No association at either age	NR	NR	Maternal age, maternal education, social class, marital status, maternal tobacco smoking during pregnancy, parity, family income, ethnicity, the number of children (<16 years old) living in the	Dataset from ALPAC cohort

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									family home, stimulation in the home environment, duration of breastfeeding and other dietary trajectories	
'Ready-to-eat' dietary pattern and IQ	PCS (Smithers et al, 2012) (1366) England	Exposure assessed at 6, 15 and 24 months	Outcome assessed at 8 years of age	'Ready-to-eat' dietary pattern (at 24 months) (characterised by *biscuits, bread or toast, breakfast cereal, yogurt,	FSIQ	At age 24 months was associated with increase in FSIQ at age 8 years	NR	NR	Maternal age, education, social class, marital status, tobacco, smoking, family income, parity, ethnicity, number of	Dataset from ALPAC cohort

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				milk pudding, cola at age 24 months)					children (<16 years old) living in the family home and dietary pattern scores at younger ages.	
‘Ready-to-eat’ dietary pattern and verbal IQ	PCS (Smithers et al, 2012) (1366) England	Exposure assessed at 6, 15 and 24 months	Outcome assessed at 8 years of age	‘Ready-to-eat’ dietary pattern (at 24 months) (characterised by *biscuits, bread or toast, breakfast cereal, yogurt, milk pudding,	VIQ	At age 24 months was associated with increase in VIQ at age 8 years	NR	NR	Maternal age, education, social class, marital status, tobacco, smoking, family income, parity, ethnicity, number of children (<16 years	Dataset from ALPAC cohort

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				cola at age 24 months)					old) living in the family home and dietary pattern scores at younger ages.	
'Ready-prepared baby foods' pattern and IQ	PCS (Smithers et al, 2012) (1366) England	Exposure assessed at 6, 15 and 24 months	Outcome assessed at 8 years of age	'Ready-prepared baby foods' pattern (at 6 and 15 months) (*characterised by rice cereal, other baby cereal, rusks, baby meat,	FSIQ	At age 6 and 15 months associated with decrease in FSIQ at age 8 years	NR	NR	Maternal age, education, social class, marital status, tobacco, smoking, family income, parity, ethnicity, number of children (<16 years old) living in the	Dataset from ALPAC cohort

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				baby vegetables, baby milk pudding, baby fruit pudding at age 6 and 15 months)					family home and dietary pattern scores at younger ages.	
'Ready-prepared baby foods' pattern and verbal IQ	PCS (Smithers et al, 2012) (1366) England	Exposure assessed at 6, 15 and 24 months	Outcome assessed at 8 years of age	'Ready-prepared baby foods' pattern (at 6 and 15 months) (*characterised by rice cereal, other baby cereal, rusks, baby	VIQ	At age 6 and 15 months associated with decrease in VIQ in age 8 years	NR	NR	Maternal age, education, social class, marital status, tobacco, smoking, family income, parity, ethnicity, number of children (<16 years old) living	Dataset from ALPAC cohort

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				meat, baby vegetables, baby milk pudding, baby fruit pudding at age 6 and 15 months)					in the family home and dietary pattern scores at younger ages.	
‘Freshly-cooked’ pattern and vocabulary	PCS (von Stumm et al, 2012) (5217) Scotland	Exposure and outcome assessed at 3 and 5 years	Exposure and outcome assessed at 3 and 5 years	Slow’ (sit down restaurant, or meal with fresh ingredients) Compared with consuming more ‘fast’ meals	Vocabulary	Consuming more slow meals at age 3 was associated with increase in vocabulary at age 3 and 5 years	NR	NR	Socioeconomic status and cognitive ability from earlier assessments	Consuming more slow versus fast food meals (frozen or ready prepared, take away) per week partially mediated the effect of socioeconomic status on

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
‘Freshly-cooked’ pattern and cognitive performance				(frozen or ready prepared, take away)	Cognitive performance (measured by picture test to assess non-verbal reasoning)	Associated with higher cognitive performance at age 5 years	NR	NR		cognitive performance at age 3 and 5 years
	SR Tandon et al (2016) AMSTAR 2 confidence rating: critically low									
‘Traditional’ dietary pattern and IQ	PCS (Smithers et al, 2013) (7652) England	Exposure assessed at 6, 15 and 24 months	Outcome assessed at 8 and 15 years of age	‘Traditional’ patterns (characterised by meat, cooked vegetables, and puddings)	IQ	Were associated with lower IQ at age 15 years (but not 8 years)	NR	NR	Maternal age, maternal education, social class, marital status, maternal tobacco smoking during pregnancy, parity, family income, ethnicity,	

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									the number of children (<16 years old) living in the family home, stimulation in the home environment, duration of breastfeeding and other dietary trajectories	

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Snacking and IQ	PCS (Northstone et al, 2012) (3,966) England	Exposure assessed at 3 and 4 years,	Outcome assessed at age 8.5	'Snack' pattern (finger foods such as fruit, biscuits, bread and cakes)	IQ IQ assessed using Wechsler Intelligence Scale for Children (WISC) Version III	At age 3 was associated with an increase in IQ at age 8.5 years	NR	NR	Age at WISC testing and WISC administrator, dietary pattern scores at that time point, breastfeeding duration, energy intake, maternal education, maternal social class, maternal age, housing tenure, life events, HOME score and	*Dietary patterns obtained via principal component analysis (PCA)

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									all other dietary pattern scores	

Dietary (non-nutrient) components

Table A8.29 Probiotics

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Probiotics										
	SR Onubi et al (2015) AMSTAR 2 confidence rating: low									
Probiotics and weight	RCT (Firmansyah et al, 2009) (393) Indonesia	12 months	12 months duration outcome measured between 12 months and 16 months (not clear if age or time)	Twice-daily dose of Bifidobacterium longum and Lactobacillus rhamnosus with 200ml milk + prebiotics + LC-PUFA (+ normal diet) compared with a	Weight gain (per day)	MD 0.93g per day	0.12 to 1.95	0.025	N/A	- For weight and weight-for-age this was significantly higher than the growth standards recommended by the WHO for the age group - not clear effect on change in weight was due to the probiotics, prebiotics or LC-PUFA.

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				twice-daily intake of 200ml milk + normal diet						
Probiotics and weight-for-age	RCT (Firmansyah et al, 2009) (393) Indonesia	12 months	12 months duration outcome measured between 12 months and 16 months (not clear if age or time)	Twice-daily dose of Bifidobacterium longum and Lactobacillus rhamnosus with 200ml milk + prebiotics + LC-PUFA (+ normal diet) compared with a	Change in weight-for-age	MD 0.09	0.01 to 0.18	0.036	N/A	- For weight and weight-for-age this was significantly higher than the growth standards recommended by the WHO for the age group - not clear effect on change in weight was due to the probiotics, prebiotics or LC-PUFA.

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				twice-daily intake of 200ml milk + normal diet						
Probiotics and change in length	RCT (Firmansyah et al, 2009) (393) Indonesia	12 months	12 months duration outcome measured between 12 months and 16 months (not clear if age or time)	Twice-daily dose of Bifidobacterium longum and Lactobacillus rhamnosus with 200ml milk + prebiotics + LC-PUFA (+ normal diet) compared with a	Change in length (linear growth)	There was no significant difference in change in length between groups	NR	NR	N/A	None

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				twice-daily intake of 200ml milk + normal diet						
Probiotics and weight-for-age z-score (WAZ) and weight-for-length z-score (WLZ)	RCT (Saavedra et al, 2004) (131) USA	Age 3 to 24 months	210 ± 127 day duration	A high dose probiotic (1x107 Bifidobacterium lactis Bb12 and Streptococcus thermophilus CFU/g of standard milk-based formula), a low dose probiotic	Monthly change in WAZ and WLZ	No difference in effect for either outcome	NR	NR	N/A	Intake in each group had to be ≥240 ml per day for more than 14 days.

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				(1x106 of the above) and a control (standard milk-based formula with no probiotics)						
Probiotics and height-for-age z-score	RCT (Saavedra et al, 2004) (131) USA	Age 3 to 24 months	210 ± 127 day duration	A high dose probiotic (1x107 Bifidobacterium lactis Bb12 and Streptococcus thermophilus CFU/g of standard milk-	Monthly change height-for-age z-score	No difference	NR	NR	N/A	Intake in each group had to be ≥240 ml per day for more than 14 days.

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				based formula), a low dose probiotic (1x106 of the above) and a control (standard milk-based formula with no probiotics)						

Table A8.30 Non-nutritive sweeteners

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	SR Karalexi et al (2015) AMSTAR 2 confidence rating: critically low									
Non-nutritive sweeteners and BMI z-score	PCS (Kral et al, 2008) (177) USA	Age range 3 to 6 years old mean age 4.5	Duration 3 years	Diet soda	BMI z-score	No association	NR	>0.10	Change in BMI z-score or waist circumference from ages 3 to 5 years and total energy intake from food at age 3 years	None
Non-nutritive sweeteners and BMI	PCS (Newby et al, 2004) (1345) USA	Mean age 2.9 years (*included children age 2 to 5 years)	6 months to 1 year	Non-nutritive sweeteners *diet soda	BMI	No association (OR 1.01 from metanalysis)	0.97 to 1.05	NR	Model 1: sex, change in height, baseline age, baseline total energy. Model 2: same as	It is not known which model the review authors used for their quantitative synthesis

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									Model 1 + birthweight, maternal years of education, ethnicity, residence and poverty. Model 3: same as Model 2 but excluded total energy from the model as it could be in the causal pathway	
Non-nutritive sweeteners and Type 1 diabetes	PCS (Lamb et al, 2015) (2547)	Mean age 2 years	10.2 years	Non-nutritive sweeteners	(a) Islet autoimmunity (b) Progression	(a) No association (OR 1.07)	(a) 0.96 to 1.20 (b) 0.69 to 1.49	NR	The analysis adjusted for adjusted for the	Children at increased risk of developing type 1 diabetes

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
					to type 1 diabetes	(b) No association (OR 1.02)			HLA-DR, DQ genotype, type 1 diabetes family history, ethnicity (non-Hispanic white vs other), diet survey type (FFQ or Young Adolescent Questionnaire (YAQ)) and total energy.	

Eating and feeding behaviours

Table A8.31 Children's eating behaviours and child weight

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Picky eating										
	Brown et al (2016) AMSTAR 2 confidence rating: moderate									
Picky eating and BMI z-score	PCS (Gregory et al 2010) (156) Australia	Age 2 to 4 and 3 to 5 years	12 months	Food responsiveness, food fussiness and interest in food Child Eating Behaviour Questionnaire (CEBQ)	BMI z-score	No association between child eating behaviours at ages 2 to 4 years (mean age 3.3 years) and BMI z-score at ages 3 to 5 years (mean age 4.3 years) (R^2_{Change}= 0.01; p=0.707)	NR	NR	Child baseline BMI z-score, age and gender, maternal age, maternal BMI and education*	None

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Picky eating and change in standardised weight status	PCS (Hittner et al 2011) (486) USA	Mean age 12.22 months*	Mean age 36.12 months*	Changes in 3 feeding behaviours assessed (reactivity to food, predictable appetite, distractibility at mealtime) + 5 temperaments from ages 1 to 3 years 4 clusters of emergent eating patterns were identified, one of which was "emerging high-reactive and fussy eaters"*	Weight-for-length z-score at age 1 year BMI z-score at age 3 years	Fussy eaters had the lowest weight-to-length z-score of the 4 clusters at year 1 (-1.02, SD 1.26) No association [between eating clusters] with change in standardised weight from year 1 to year 3 (mean 0.48; SD 1.25)	NR	0.4	Analyses investigated differences in eating factors between genders (no difference)*	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Picky eating and change in BMI	PCS (Jacobi et al 2003) (135) USA	Age 3.5 years	Age 5.5 years	Parental perceptions of child's picky eating measured by the Stanford Feeding Questionnaire (SFQ)	BMI	No association overall between picky eating at 4 and 5 years and change in BMI at ages 4 and 5, but girls with PE had increase in BMI over 1 year (15.3 to 15.7) compared with non-picky girls (16.4 to 16.3) (no association in boys)	NR	NR	Analyses conducted separately for boys and girls	Quantitative data not reported by SR Children with PE were lighter at baseline than children without PE*

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Picky eating and odds of underweight	PCS (Dubois et al 2007) (1498) Canada	Age 2.5, 3.5 and 4.5 years	Age 4.5 years	Picky eating Eating Behaviour Questionnaire adapted from ALSPAC*	BMI	OR 2.4 Increased odds of being underweight at age 4.5 years if picky at all 3 ages compared with children who were never picky No association with weight status if picky at 1 or 2 of the ages measured vs never picky (data	1.4 to 4.2	NR	Child characteristics (sex, birthweight, day care attendance, food insecurity status) maternal characteristics (age, immigrant status, education, smoking status	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						not reported)			during pregnancy), family characteristics (type, household income, number of obese parents)* Study did not adjust for child baseline weight	

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Inability to delay gratification and child weight										
	Caleza et al (2016) AMSTAR 2 confidence rating: critically low									
Inability to delay gratification and risk of overweight	PCS (Seeyave et al 2009) (805) USA	Age 4 years	Age 11 years	Children given an Ability to Delay Gratification (ATDG) task using food (known to be the child's preferred food)* Delay duration: 7 minutes	BMI at age 11 years	RR 1.29 Children that failed the ATDG task were more likely to be overweight at age 11 years (compared with children who passed the task)	1.06 to 1.58	NR	BMI z-score at age 4 years (baseline), sex, ethnicity, income-to-needs ratio, maternal marital status*	Review authors state that this study used an adequate prospective calculation of the sample size

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Inability to delay gratification and change in BMI z-score	PCS (Francis and Susman, 2009) (1061)	3 years	Age 12 years	Children's self-regulatory capacity measured in 2 video-recorded behavioural procedures (1 involving food, one not involving food) designed to assess the extent to which children exhibit self-regulatory skills at ages 3 and 5 years* At age 3, the target was a non-edible toy; at	BMI at all data collection points (ages 3, 5, 7, 9, 11 and 12 years)* Dependent variable of the analysis was change in BMI z scores from age 3 to 12 years	Children low in self-regulation (who scored low in both tasks) had the most rapid gains in BMI z score from age 3 to 12 compared with children with high self-regulation Change in BMI z score in children with low self-regulation	NR	NR	Identical mixed models were run separately for boys and girls* Analyses adjusted for maternal education and family income*	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				age 5, the target was snack food* Delay duration: 150 seconds (for toy)* 210 seconds (for food)		(0.57± 0.05)				
Eating or skipping breakfast										
	Blondin et al (2016) AMSTAR 2 confidence rating: critically low									
Breakfast consumption and child odds of overweight	PCS (Kupers et al 2014) (1366) Netherlands	Mean age 2.1 years	3 years	Parent-reported questionnaire included a question on breakfast frequency: ‘How often does your child eat breakfast weekly?’ at age 2 and 5 years	BMI	OR 0.72 Odds of overweight at age 5 years in children who skip breakfast at age 2 and 5 years vs not skipping breakfast at age 2	0.15 to 3.49	NR	Birth weight, origin (Dutch or non-Dutch), maternal educational level, maternal and paternal BMI	Null findings attributed to the infrequency of breakfast skipping at both baseline and follow-up in this sample (3.0-5.3%) Risk of being overweight at age 5 years was based on BMI z-score (Dutch

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						and 5 years			at 2 or 5 years, and family type (single-parent family or not).	reference growth charts (1997) and Cole's BMI category cut-off for overweight status)

Table A8.32 Feeding practices on fruit or vegetable intake or acceptance

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Feeding practices (collectively) and vegetable intake										
	Hodder et al (2017) AMSTAR 2 confidence rating: high									
Feeding practices and vegetable consumption	MA of 13 trials (1741) Mostly high-income countries (HIC)	≤5 years	Immediate to 6 months Mean duration of follow-up was 6.2 weeks.	Interventions designed to increase fruit or vegetable intake. Repeated exposure (6 studies), pairing with positive stimuli (3 studies) and infant feeding practices (4 studies) vs no treatment	Vegetable intake	SMD 0.33 Equivalent to an increase of 3.50 grams of as-desired vegetable consumption	0.13 to 0.54	0.0014	NR	I^2=70% Random-effects model Study estimates that adjusted for potential confounding variables were selected for inclusion in MA Review authors graded this evidence very low quality (using GRADE) due to unexplained heterogeneity, methodological limitations (related to allocation

										concealment and selective reporting being at unclear or high risk for most of the trials) High probability of publication bias related to the relatively few trials included in the meta-analysis and inspection of funnel plots
Feeding practices and vegetable consumption	Sensitivity analysis of 5 trials at low or unclear risk of bias (487)	≤5 years	1 to 3 weeks	Repeated exposure (3 studies) Pairing with positive stimuli (2 studies)	Vegetable intake	SMD 0.23	0.03 to 0.44	0.026	NR	I^2=14% Random-effects model
Feeding practices and vegetable consumption in children from low SES backgrounds	RCT (Cooke et al, 2011) (216) UK	Age 4 to 5 years	3 weeks, 12 exposure sessions	1) repeated exposure (RE) 2) RE + non-food reward (sticker) 3) RE + social reward (praise) 4) no intervention	Target vegetable intake (g)	RE coupled with reward significantly increased the consumption of a	NR	NR	NR	Sample size calculation performed

						target vegetable				
Feeding practices and vegetable consumption in children from low SES backgrounds	RCT (Smith et al, 2017) (240) USA	Age 3 to 5 years	8 weeks	1) weekly take home of fruits and vegetables 2) weekly take home of vegetable and fruit + nutrition education, which included tastings	Consumption of vegetable and fruit consumption measured by carotenoid levels in the skin	Both interventions increased vegetable and fruit consumption compared with no intervention	NR	NR	NR	Sample size calculation performed
	Nekitsing et al (2018) AMSTAR 2 confidence rating: low									
Feeding practices and vegetable consumption	MA of 30 intervention studies (4017) Mostly high-income countries (HIC)	Mean age 3.8 years (based on 19 studies that reported age)	2 single sessions to 8 months	Interventions were educational interventions, repeated exposure, pairing or stealth, food services, reward, modelling, choice,	Vegetable intake	SMD: 0.40	0.31 to 0.50	<0.001	NR	I^2=73.4% Random-effects model Subgroup analyses found that effect size varied significantly ($p<0.05$) by study design, outcome measures,

				variety, visual presentation versus no treatment or baseline consumption; usual care or received treatment after the intervention phase						intervention recipient (child or parent or teacher), intervention strategy and type of vegetable used Funnel plot asymmetry and results of Egger's test suggest presence of publication bias Duval and Tweedie's trim and fill method indicate that under the random-effects model, 8 studies are missing. If these were added, then the imputed combined effect would be g=0.31 (95% CI 0.21 to 0.41)

Feeding practices and vegetable consumption	MA of 44 intervention arms across 30 studies (4017) Mostly high-income countries (HIC)	Mean age 3.8 years (based on 19 studies that reported age)	2 single sessions to 8 months	Interventions were educational interventions, repeated exposure, pairing or stealth, food services, reward, modelling, choice, variety, visual presentation versus no treatment or baseline consumption; usual care or received treatment after the intervention phase	Vegetable intake	SMD: 0.42	0.33 to 0.51	<0.001	NR	I^2=69.07%
Repeated taste exposure and vegetable intake										
	Nekitsing et al (2018) AMSTAR 2 confidence rating: low									

Repeated exposure and vegetable consumption	Subgroup MA of 10 intervention studies (participants NR) Mostly high-income countries (HIC)	Unclear Mean age of children 3.8 years across in 19 studies included in SR with data on age	Unclear – but likely <8 months	Repeated taste exposure (alone or coupled with other strategies such as reward, modelling) versus no treatment or baseline consumption; usual care or received treatment after the intervention phase	Vegetable intake	(a) SMD: 0.57 (b) Meta-regression analysis of the 10 studies involving taste exposure found that the number of taste exposures was directly associated with effect size: Beta coefficient 0.035 Children require 8-10 exposures for a significant improvement in intake (a	(a) 0.43 to 0.70 (b) 0.00 to 0.06	(a) NR (b) 0.01	NR	(a) I^2=52% Random-effects model

						moderate effect size or SMD 0.5)				
Repeated exposure and vegetable consumption	Subgroup MA of 5 intervention arms (number of studies NR) (134) Mostly high-income countries (HIC)	Unclear Mean age of children 3.8 years across in 19 studies included in SR with data on age	Unclear – but likely <8 months	Repeated taste exposure only versus no treatment or baseline consumption; usual care or received treatment after the intervention phase	Vegetable intake	SMD: 0.79	0.53 to 1.05	NR	NR	I^2 NR Random-effects model
	Mura Paroche et al (2017) AMSTAR 2 confidence rating: critically low									
Repeated taste exposure with pairing on intake of vegetables	Intervention study (Caton et al, 2014) (332) UK, Denmark, France	4 to 38 months	Unclear	Children were randomly assigned to 1 of 3 conditions Repeated exposure (x10) to artichoke	Vegetable intake (artichoke) Pre- and post-intervention measures of artichoke	5 to 10 exposures to the taste of the unfamiliar vegetables was needed to	NR	NR	NR	

				puree that was (a) basic or unflavoured (b) sweet (flavour-flavour learning, FFL) (c) added energy (flavour-nutrient learning, FNL)	puree were measured	increase intake of that vegetable 2 weeks after the intervention.				
Repeated taste exposure and pairing on vegetable intake										
	Nekitsing et al (2018) AMSTAR 2 confidence rating: low									
Repeated taste exposure with pairing on intake of vegetables	Subgroup MA of 8 intervention arms (number of studies NR) (358) Mostly HIC	Unclear Mean age of children 3.8 years across in 19 studies included in SR with data on age	Unclear– but likely <8 months	Repeated taste exposure to vegetables plus pairing (with liked foods, flavours, additional nutrients)	Vegetable intake	SMD: 0.43	0.26 to 0.61	NR	NR	I^2 NR Conclusion of review authors: taste exposure to the vegetable on its own (plain form) produced a larger impact on intake than pairing with other flavours, dips or energy

	Mura Paroche et al (2017) AMSTAR 2 confidence rating: critically low									
Repeated taste exposure with pairing on intake of vegetables	Intervention study (Caton et al, 2014) (332) UK, Denmark, France	4 to 38 months	Unclear	Children were randomly assigned to 1 of 3 conditions Repeated exposure (x10) to artichoke puree that was (1) basic or unflavoured (2) sweet (flavour-flavour learning, FFL) (3) added energy: 144kcal per 100g from sunflower oil* (flavour-nutrient learning, FNL)	Vegetable intake (artichoke) Pre- and post-intervention measures of artichoke puree were measured	Children in the added energy condition (FNL) showed the smallest change in intake over time, compared with those in the basic or sweetened artichoke condition (FFL). Contrary to expectation the FNL was less effective than RE.	NR	NR	NR	None
Repeated taste exposure and acceptance of textures (fruit or vegetable)										
	Mura Paroche et al (2017) AMSTAR 2 confidence rating: critically low									

Repeated taste exposure to textures and acceptance of new complex textures	Intervention study (Lundy et al 1998) (12) USA	13 to 22m	20 days	3 intervention groups: (1) 10 days of exposure to pureed texture (apple sauce) followed by 10 days of exposure to a lumpy texture (2) 20 days exposure to lumpy texture (3) 20 days exposure to a pureed texture	Acceptance of complex textures (measured by head and body movements and eagerness)	Increased acceptance of complex textures	NR	NR	NR	Quantitative data not reported by SR
Repeated taste exposure to textures and vegetable consumption	Intervention study (Blossfeld et al 2007) (70) USA	12m	2 test sessions*	Children exposed to cooked carrots with 2 different textures: pureed and chopped	Intake of carrots (pureed and chopped)	Children consumed more pureed carrots than chopped carrots at age 12 months but children with more teeth were more accepting	NR	NR	NR	Quantitative data not reported by SR

						of chopped carrots. However, children's intake of chopped carrots was predicted by previous experiences of carrots in a variety of forms (tastes and textures)				
Repeated visual exposure and preference or acceptance (fruit or vegetable)										
	Mura Paroche et al (2017) AMSTAR 2 confidence rating: critically low									
Repeated visual exposure and taste preference (fruit)	Intervention study (Birch et al, 1987) (43) USA	23 to 69 months	Unclear	Children received either 'look' or 'taste' exposures to 7 unfamiliar fruits. Foods were exposed 5, 10, or 15	Visual and taste preferences of previously exposed foods	Visual exposure enhanced visual preferences of foods while taste exposure enhanced taste	NR	NR	NR	Quantitative data not reported by SR

				times and one fruit remained unfamiliar. After exposure, children were assigned to make 2 judgements of the 21 food pairs based: one based on looking and one based on tasting the foods, and choosing the one they liked best		preferences of foods. However, visual exposure to foods did not correlate with taste preferences of the same foods				
Repeated visual exposure and willingness to taste (fruit)	Intervention study (Houston-Price et al, 2009) (20) UK	21 to 24 months	2 weeks	Repeated visual exposure to pictures of fruits and vegetables every day for 2 weeks; half the fruits and vegetables were familiar to the child, half were not familiar	Child’s willingness to taste unfamiliar fruits (taste test)	Prior visual exposure to an unfamiliar fruit increased willingness to taste the fruit compared with a non-exposed	NR	NR	NR	Quantitative data not reported by SR

						unfamiliar fruit				
Repeated visual exposure and willingness to taste (vegetable)	Intervention study (Houston-Price et al, 2009) (20) UK	21 to 24 months	2 weeks	Repeated visual exposure to pictures of fruits and vegetables every day for 2 weeks; half the fruits and vegetables were familiar to the child, half were not familiar	Child's willingness to taste unfamiliar vegetables (taste test)	Prior visual exposure to a familiar vegetable decreased willingness to taste the vegetable compared with a non-exposed familiar vegetable	NR	NR	NR	Quantitative data not reported by SR
Repeated visual exposure and willingness to taste (vegetable)	Intervention study (Heath et al 2014) (68) UK	20 to 24 months	2 weeks	Repeated visual exposure to pictures of liked, disliked and unfamiliar vegetables every day for 2 weeks	Child's willingness to taste initially liked, disliked or unfamiliar vegetables after visual exposure vs	Children were more easily persuaded to eat the target food than a matched control vegetable,	NR	NR	NR	Quantitative data not reported by SR

					control vegetable of same initial status (preference and familiarity) Amount of each food eaten was also measured*	and consumed more of the target food. The strongest exposure effect was seen for initially unfamiliar vegetables				
Multicomponent interventions										
	Hodder et al (2018) AMSTAR 2 confidence rating: high									
Multicomponent interventions and vegetables and fruit intake	Cluster-RCT (De Bock et al, 2012) (348) Germany	3-6 years	6 months	Intervention activities consisted of familiarizing with different food types and preparation methods as well as cooking and eating meals together in groups of children, teachers and parents. Availability of fruit,	Children: Height, weight, waist circumference, total body fat using skinfold measurement. Parents: Questionnaire assessing multiple domains of behaviour including	Children's vegetables and fruit intakes increased significantly. No significant changes in the consumption of water and sugared drinks were found.	NR	NR	N/A	High drop-out rate

				vegetables and water was increased.	Children's' eating behaviour and physical activity. Food frequency questionnaire Socio-demographic information	No anthropometric measurements changes were found.				

Table A8.33 Feeding practices on children's preferences for sweet taste

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Appleton et al (2018) AMSTAR 2 confidence rating: moderate									
Taste exposure and food preference (sweet taste)	Controlled trial (Sullivan and Birch, 1990) (39) USA	Age 44 to 71 months (mean age: 55 months)	9 weeks	Pre-intervention*: preferences were measured for 6 unfamiliar foods (including 3 versions of tofu and ricotta cheese) Intervention: 2 times per week for 9 weeks (total of 15 exposures) to either sweet tofu (14g sucrose per 100g), salted tofu (2g salt	(a) preference for 3 varieties of tofu and ricotta cheese (plain, salted, sweetened) (b) In subset of participants: preference for plain, salted, sweetened tofu vs same 3 versions of jicama (completely unfamiliar food)*	Preference for exposed variety of tofu increased regardless of whether it was sweet, salty or plain; but increased preference for the exposed flavour did not have an effect on preference for the other unexpose	NR	NR	NR	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				per 100g), or plain tofu	Rank order of foods from "most liked" to "least liked" Outcome measured: (a) pre-exposure, after 8th and 15th exposures (b) after 15th exposure	d varieties* 1 and 2: children preferred sweet ricotta cheese and sweet jicama to the other varieties, but exposure to sweet variety of tofu did not increase preference for sweet ricotta or jicama compared with exposure				

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						to salty or plain tofu Preference increased for the exposed version only* Interpretation by SR: exposure impacts on preferences for same food, but has no impact on preferences for other sweet foods				

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Taste exposure and food preference (sweet taste)	Controlled trial (Ogden et al, 2012) (53) UK	Age 1 to 7 (mean age 3)	2 days	Restriction group: 75g chocolate coins given to children to eat over ~2 days following restrictive rules (parental restriction on how much and when child could eat the chocolate coins) Non-restriction group: 75g chocolate coins given to children following non-restrictive rules	At start and end of trial, parents asked to rate child's preoccupation with food in terms of 4 constructs: (a) Demanding chocolate coins (b) Eating chocolate coins (c) Demanding other sweet foods (d) Eating other sweet foods	Reduced demanding and eating chocolate in both groups, and greater in non-restricted group. Increased demands for other sweet foods in non-restricted group compared with restricted group. No effects in eating other	NR	NR	NR	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				(children were allowed to eat the coins as and when they wanted over ~2 days)		sweet foods. Interpretation by SR: exposure (lower restriction) reduces demand for same sweet food, but increases demand for other sweet foods				
Taste exposure and food preference (sweet taste)	PCS (Sonneville et al, 2015) (1163) USA	1 year	Median age 3.1 years and 7.7 years	Fruit juice intake per day 1) small: 1 to 7oz 2) medium: 8 to 15 oz 3) large: 16 oz	Consumption of fruit juice, SSBs (soda, fruit drinks) (servings per day)	Juice intake vs no juice intake at age 1 year was associated with higher SSB (medium	NR	NR	Models adjusted for confounders: maternal age, education, pre-	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				Parent-completed questionnaire for past month Also measured water intake		and large intakes) and juice consumption (all intakes) at ages 3 and 7 years (SSB and juice, all intake levels). Interpretation by SR: higher consumption of juice in early childhood is associated with higher consumption of juice and SSB			pregnancy BMI, household income, child age, sex, ethnicity, weight-for-length z score at 1 year	

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						in later years No association with water intake at age 1 year				
Taste exposure and food preference (sweet taste)	PCS (Okubo et al, 2016) (493) Japan	16 to 24 months	~2 years (aged 41 to 49 months)	Exposure to SSBs (non-100% fruit juice, other sweetened juice) at ages 16 to 24 months: 1) <1 per week 2) 1 to 3 per week 2) 4 to 6 per week 3) ≥1 per day Parent-completed questionnaire assessing	Consumption of fruit, confectionary, 100% fruit and vegetable juice, SSBs (fermented milk drinks, sugars-sweetened drinks, cocoa) Units: g per 1000 kcal per day	Higher early SSB intakes (>1 week*) are associated with later higher intakes of SSBs and some other sweet foods and lower intakes or no associations with	NR	NR	Demographic differences between groups Models adjusted for confounders*: Child factors (birth order, birth weight, breastf	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				preceding month		other sweet foods			eeding duration, age at introduction to solid foods, body weight at age 42 months); maternal factors (BMI, education, employment, income, smoking, matern	

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									al SSB consumption during pregnancy and at 42 months postpartum)	

Table A8.34 Feeding practices on food acceptance or intake

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Parental restriction on food acceptance or intake										
	Osei-Assibey et al (2012) AMSTAR 2 confidence rating: low									
Parental restriction and total energy intake	Nested non-randomised controlled trial (Sud et al, 2010) (70) USA	4 to 6 years	4 dinner visits, of 1 day each	At each visit children were offered an ab libitum laboratory dinner* Parental restriction (including access to palatable foods) assessed by Child Feeding Questionnaire (CFQ)*	Total energy intake	Restrictive feeding practices were not associated with total energy intake	NR	0.5	NR	Quantitative data not reported by SR
	Mura Paroche (2017) AMSTAR 2 confidence rating: critically low									

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Effect of restriction or monitoring and children's eating behaviours or interest in food	PCS (Gregory et al, 2010) (156) Australia	2 to 4 years (mean 3.3 years)	Mean age 4.3 years	Maternal (a) pressure to eat (b) restriction (c) monitoring (all measured by the Child Feeding Questionnaire)* plus (d) modelling of healthy eating (answers to 3 items on modelling healthy eating measured using a 5-point Likert scale)	(1) Children's eating behaviours (using items from the food responsiveness and food fussiness subscales of the Child Eating Behaviour Questionnaire (CEBQ)* Items measured: -food fussiness -food responsiveness -interest in food	(a) Pressure to eat at baseline inversely predicted child interest in food at follow up (b) and (c) Restriction and monitoring did not predict changes in child eating behaviour (changes in food fussiness or responsiveness or	NR	NR	Eating behaviour at baseline, child age, gender, maternal age, BMI, education	'Interest in food' not defined

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
					(2) child BMI z-scores	interest in food (d) modelling of healthy eating at baseline inversely predicted child food fussiness at follow up Maternal feeding practices did not prospectively predict child food responsiveness or BMI				

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Effect of modelling on food acceptance or intake										
	Ward et al (2015) AMSTAR 2 confidence rating: moderate									
Effect of adult modelling and food acceptance (familiar and unfamiliar)	Series of quasi-experimental studies (Hendy and Raudenbush, 2000) (97) USA	Preschool children (age not specified)	Unclear	Study 1 (n=34): Familiar lunch foods presented under either silent teacher modelling vs simple exposure Study 2 (n=23): Unfamiliar foods presented under silent teacher modelling vs simple exposure Study 3 (n=26): Unfamiliar foods	Study 1: Acceptance of four familiar foods (unspecified) across 3 school lunches (measured in number of bites) Study 2: Acceptance of 4 unfamiliar foods (chickpeas, prunes, water chestnuts, matzo crackers*) across 3	Silent modelling vs simple exposure Familiar foods sampled: MD -0.305 (p ≥ 0.05) Unfamiliar foods sampled: MD 0.024 (p≥ 0.05) Enthusiastic modelling vs simple exposure Bites of new food: MD 5.08 (p<0.03)	NR	See 'Measure of association or effect'	NR	Different children recruited for each study

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				presented under either enthusiastic teacher modelling vs simple exposure Study 4 (n=14) Unfamiliar foods presented under either enthusiastic teacher modelling vs enthusiastic peer modelling vs simple exposure	school lunches (measured in number of bites) Study 3: Acceptance of 2 unfamiliar foods (fresh mango and dried cranberries*) across 5 school lunches (measured in number of bites) Study 4: Acceptance of 3 unfamiliar foods (fresh mango, fresh kiwi, dried	After adjusting for peer modelling, the association between enthusiastic modelling and acceptance of new food was no longer significant (p=0.35).				

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
					apples*) across 5 school lunches (measured in number of bites)					
Effect of adult modelling and acceptance of vegetables and fruit (unfamiliar)	Quasi-experimental studies (Hendy et al, 1999) (64) USA	Preschool children (age not specified)	3 consecutive days	Four unfamiliar foods (kiwi fruit, chickpeas, coconut and sweet red pepper*) presented to the children during preschool lunch for 3 consecutive days Teachers were randomly assigned to 5 actions to	(a) Number of foods sampled with at least 1 bites (b) Number of meals during which at least one of the new foods was sampled (c) Total number of bites of new foods across all 3 meals	Silent modelling was not more effective compared with simple exposure (a) MD 0.8 (p ≥ 0.05) (b) MD 0.55 (p ≥ 0.05) (c) MD 2.75 (p ≥ 0.05)	NR	See 'Measure of association or effect'	NR	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				encourage children’s food acceptance: (1) Simple exposure (control) (n=12) (2) Silent modelling (n=14) The teachers also said “I like to try new foods” twice during each of the 3 meals (3) Reward (food) (n=14) (4) Ask to try one bite (n=14) (5) Choice offering (n=10)						

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Mura Paroche et al (2017) AMSTAR 2 confidence rating: critically low									
Effect of adult modelling and food consumption (unfamiliar food)	Intervention study (Addessi et al, 2005) (27) USA	2 to 5 years	Unclear	Children were assigned to one of 3 intervention groups: (a) Presence (a model was present but not eating the food), (b) Different food (model and child ate different foods) (c) Same food (model and child ate the same foods)	Child acceptance of unfamiliar food (semolina)*	Children in the 'same food' condition ate more of the unfamiliar food than those in the 'presence' and 'different food' conditions. Children's ages (below or above the median age of 45 months), early feeding practices	NR	NR	NR	Quantitative data not reported by SR School setting

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						and classroom membership did not affect food acceptance				
Effect of adult modelling and fruit or vegetable consumption (familiar and unfamiliar food)	Intervention study (Edelson et al 2016) (60 families with children aged 12 to 36 months)	12 to 36 months	Unclear	Parents video recorded all regular eating occasions over one day, plus an additional meal in which parents introduced a unfamiliar fruit or vegetable to the child.* Parents also completed a feeding style questionnaire * Prompts	Child food intake (Parents completed 3 x 24 hour dietary recalls 3 months after the video recordings)	The most immediately successful prompt for regular meals across food types was modelling (compared to a neutral prompt as a reference*). A prompt	NR	NR	NR	Quantitative data not reported by SR Home setting

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				used by parents included pressure to eat, use of another food or a non-food item as a reward, reasoning with the child, and modelling.		was considered 'successful' if the child took a bite of the target food within 20s of the prompt without making a refusal in between* For the unfamiliar food condition, no prompting technique was significantly better than a neutral				

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						prompt (for example, “eat your peas” spoken in a neutral or positive tone of voice) *				
Effect of adult modelling and children’s eating behaviours or interest in food	PCS (Gregory et al, 2010) (156) Australia	2 to 4 years (mean 3.3 years)	Mean age 4.3 years	Maternal (a) pressure to eat (b) restriction (c) monitoring (all measured by the Child Feeding Questionnaire)* plus (d) modelling of healthy eating (parental answers to 3 items on modelling	(1) Children’s eating behaviours (using items from the food responsiveness and food fussiness subscales of the Child Eating Behaviour Questionnaire (CEBQ)*	(a) Pressure to eat at baseline inversely predicted child interest in food at follow up (b) and (c) Restriction and monitoring did not predict changes in	NR	NR	Eating behaviour at baseline, child age, gender, maternal age, BMI, education	‘Interest in food’ not defined

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				healthy eating measured using a 5-point Likert scale)	Items measured: -food fussiness -food responsiveness -interest in food (2) child BMI z-scores	child eating behaviour (d) modelling of healthy eating at baseline inversely predicted child food fussiness at follow up Maternal feeding practices did not prospectively predict child food responsiveness or BMI				

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Effect of adult modelling and food acceptance (unfamiliar food)	Intervention study (Harper and Sanders, 1975) (80) USA	14 to 48 months	Unclear	Children were assigned to 3 intervention groups: (a) “offer-only condition,” (b) “adult-also-eats condition,” (c) “male or female visitor offer-only condition.” Children were offered 2 new foods at home	Child acceptance of unfamiliar foods (unspecified)	Children accepted the food item offered more often when adults were also eating, especially girls. Foods were more often accepted when presented by the mother than by a visitor, especially by children at the younger	NR	NR	NR	Quantitative data not reported by SR Home setting

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						end of the age range				
	Mikkelsen et al (2014) AMSTAR 2 confidence rating: low									
Effect of peer modelling and food acceptance (unfamiliar foods)	Quasi-experimental study (Hendy, 2002) (38) USA	3 to 6 years	Unclear	Presentation of 3 unfamiliar foods (all dried fruits) during 5 preschool meals (3 baseline meals + 2 modelled), approximately once a week* Aim of experiment was to test the	Number of bites taken of the unfamiliar foods (all dried fruits) Food preference also measured	The study found that girl models were more effective at increasing food acceptance than boy models. However, the effect disappeared after 1-month follow-up.	NR	NR	NR	Quantitative data not reported by SR Convenience sampling School setting

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				effectiveness of trained child peer models to increase child unfamiliar food acceptance						
	Mura Paroche et al (2017) AMSTAR 2 confidence rating: critically low									
Effect of peer modelling and vegetable preference	Intervention study (Birch et al 1980) (39) USA	2 to 4 years (mean age 3.1 years)	4 days	A (target) child who preferred vegetable A to B was seated with 3 or 4 peers with opposite preference patterns. Children were served their preferred and non-preferred vegetable pairs at lunch and asked to	Food choice	70% of the children showed a shift from choosing their preferred food on day 1 to choosing their non-preferred food by day 4. Consumption data corroborat	NR	NR	NR	School setting

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				choose one. On day 1 the target child chose first, while on days 2, 3, and 4 peers chose first		ed these results. In the post-intervention test, fewer than half of the peers changed their preferred foods. Younger children were more affected by peer modelling than older children				

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Effect of peer modelling and food intake (snack food)	Intervention study (Lumeng and Hillman et al 2007) (54) USA	2.5 to 6.5 years	2 sessions*	Children took part in two conditions; eating in a small group (n=3) and large groups (n=9).	Intake of snack food (plain crackers, in grams*) and duration of snack session were recorded	Children consumed approx. 30% more food when eating in a large group compared with a small group if the snack duration was longer than 11.4 min. No group differences in intake were observed when snack duration was	NR	NR	NR	School setting

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						shorter than this				
Effect of using rewards on food acceptance or intake										
	Ward et al (2015) AMSTAR 2 confidence rating: moderate									
Effect of rewards (food) and food acceptance and intake (unfamiliar vegetables and fruit)	Quasi-experimental studies (Hendy et al, 1999) (64) USA	Preschool children (age not specified)	3 consecutive days	Four unfamiliar foods (kiwi fruit, chickpeas, coconut and sweet red pepper*) presented to the children during preschool lunch for 3 consecutive days Teachers were	(a) Number of foods sampled with at least 1 bite (b) Number of meals during which at least one of the new foods was sampled (c) Total number of bites of new foods	Use of food reward (dessert or sweets)* was more effective compared with simple exposure (a) MD 2.45 (p < 0.001) (b) MD 1.5 (p < 0.001)	NR	See 'Measure of association or effect'	NR	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				randomly assigned to 5 actions to encourage children’s food acceptance: (1) Simple exposure (control)(n=12) (2) Silent modelling (n=14) the teachers also said “I like to try new foods” twice during each of the 3 meals (3) Reward (food) (n=14) (4) Ask to try one bite (n=14)	across all 3 meals	(c) MD 11.55 ($p < 0.02$)				

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				(5) Choice offering (n=10)						
Effect of rewards (non-food) and food intake (vegetable)	Pre-post study (Ireton and Guthrie, 1972) (19) USA	Preschool age (unspecified)	3-week experimental period	Various preparation methods of vegetables and use of immediate positive reinforcement (verbal praise and use of a non-food reward (stickers) vs no positive reinforcement	Child intake of cooked vegetables	Compared with no positive reinforcement, positive reinforcement, mean intakes of all vegetables (in grams) were higher when educators gave immediate positive	NR	See ‘Measure of association or effect’	NR	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						reinforcement Asparagus: MD 14.06g (p<0.001) Broccoli: MD 21.88g (p<0.01) Cauliflower: MD 15.63g (p<0.02) Spinach: MD 10.47g (p<0.001) Squash: MD 20.78g (p<0.01)				

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Verbal encouragement to eat on food acceptance or intake										
	Ward et al (2015) AMSTAR 2 confidence rating: moderate									
Effect of encouraging children to eat and food acceptance and intake (unfamiliar vegetables and fruit)	Quasi-experimental studies (Hendy et al, 1999) (64) USA	Preschool children (age not specified)	3 consecutive days	Four unfamiliar foods (kiwi fruit, chickpeas, coconut and sweet red pepper*) presented to the children during preschool lunch for 3 consecutive days Teachers were randomly assigned to 5 actions to encourage children's food acceptance:	(a) Number of foods sampled with at least 1 bite (b) Number of meals during which at least one of the new foods was sampled (c) Total number of bites of new foods across all 3 meals	Asking children to 'try one bite' was more effective compared with simple exposure (a) MD 1.85 (p<0.007) (b) MD 1.45 (p<0.001) (c) MD 5.55 (p<0.02)	NR	See 'Measure of association or effect'	NR	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				(1) Simple exposure (control) (n=12) (2) Silent modelling (n=14) The teachers also said “I like to try new foods” twice during each of the 3 meals (3) Reward (food) (n=14) (4) Ask to try one bite (n=14) (5) Choice offering (n=10)						
Offering choice on child food acceptance or intake										
	Ward et al (2015) AMSTAR 2 confidence rating: moderate									

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Effect of choice offering and food acceptance and intake (unfamiliar food)	Quasi-experimental studies (Hendy et al, 1999) (64) USA	Preschool children (age not specified)	3 consecutive days	Four unfamiliar foods (kiwi fruit, chickpeas, coconut and sweet red pepper*) presented to the children during preschool lunch for 3 consecutive days Teachers were randomly assigned to 5 actions to encourage children's food acceptance: (1) Simple exposure	(a) Number of foods sampled with at least 1 bites (b) Number of meals during which at least one of the new foods was sampled (c) Total number of bites of new foods across all 3 meals	Choice offering was more effective compared with simple exposure (a) MD 1.7 (p<0.007) (b) MD 1.0 (p<0.02) (c) MD 21.75 (p<0.007)	NR	See 'Measure of association or effect'	NR	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				(control) (n=12) (2) Silent modelling (n=14) The teachers also said "I like to try new foods" twice during each of the 3 meals (3) Reward (food) (n=14) (4) Ask to try one bite (n=14) (5) Choice offering (n=10)						
Pressure to eat on children's eating behaviours or interest in food										
	Mura Paroche (2017) AMSTAR 2 confidence rating: critically low									

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Effect of pressure to eat and children's eating behaviours or interest in food	PCS (Gregory et al, 2010) (156) Australia	2 to 4 years (mean 3.3 years)	Mean age 4.3 years	Maternal (a) pressure to eat (b) restriction (c) monitoring (all measured by the Child Feeding Questionnaire)* plus (d) modelling of healthy eating (answers to 3 items on modelling healthy eating measured using a 5-point Likert scale)	(1) Children's eating behaviours (using items from the food responsiveness and food fussiness subscales of the Child Eating Behaviour Questionnaire (CEBQ)* Items measured: -food fussiness -food responsiveness -interest in food	(a) Pressure to eat at baseline inversely predicted child interest in food at follow up (b) and (c) Restriction and monitoring did not predict changes in child eating behaviour (d) modelling of healthy eating at baseline inversely predicted	NR	NR	Eating behaviour at baseline, child age, gender, maternal age, BMI, education	'Interest in food' not defined

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
					(2) child BMI z-scores	child food fussiness at follow up Maternal feeding practices did not prospectively predict child food responsiveness or BMI				

Table A8.35 Feeding practices or styles and child weight

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Feeding practices										
	Russell et al (2016) AMSTAR 2 confidence rating: moderate									
Feeding practices and child standardised weight	PCS (Faith et al, 2006) (1797) USA	Age 1 to 5 years	Every 6 months	Questions on parental feeding practices included in self-administered survey*: “How often do you limit how much this child eats?” “Do you agree with the statement ‘Children need to finish dinner before dessert’? “Have you tried offering this child more fruit or	Weight and height measured at each interview Main outcome: Change in age- and gender-standardised BMI per month*	No differences in feeding practices and child weight (change in BMI z scores)	NR	NR	Child sex, ethnicity, baseline weight-for-height z score, food intake (servings per day)*	Quantitative data not reported by SR

				vegetables to eat?”						
	Hurley et al (2011) AMSTAR 2 confidence rating: critically low									
Feeding practices and child standardised weight	PCS (Farrow and Blissett, 2008) (62 mother-child dyads) UK	Recruited at birth	Age 2	Monitoring Restriction Pressure to eat (measured by the Child Feeding Questionnaire)	Weight SDS	Pressure and restriction at age 1 year significantly predicted lower child weight SDS at 2 years Results for monitoring NR	NR	NR	Child weight at 1 year	Mixed SES Ethnicity not reported (in primary study) Quantitative data not reported by SR
	Bergmeier et al (2015) AMSTAR 2 confidence rating: critically low									
Feeding practices or styles and weight status	PCS (Lumeng et al, 2012) (1218) USA	15, 24, 36 months	Age 36 months	(a) Assertive prompting (pressuring to eat) (verbal or physical encouragements)	Height and weight by objective measures during laboratory visits	Assertive prompting and intrusive style had small but significant associatio	NR	NR	Child’s ethnicity, sex, age family income-to-needs	Mostly white participants Quantitative data not reported by SR

				(b) Intrusiveness defined as maternal behaviour that was adult centred rather than child-centred and imposed the mother's agenda on the child At each of the 3 ages, children and their mothers were filmed in a laboratory while the child ate a standardised snack; maternal feeding behaviours were observed and coded.	Age 15 months: weight-to-length z score (WLZ)* Ages 24 and 36 months: BMI z-score (BMIz)* WLZ and BMIz collectively referred to as adiposity z scores*	ns with greater child adiposity (across ages 15, 24 and 36 months*)			ratio, maternal education, weight status and depressive symptoms	
	Mura Paroche (2017) AMSTAR 2 confidence rating: critically low									

Feeding practices and weight status	PCS (Gregory et al, 2010) (156) Australia	2 to 4 years (mean 3.3 years)	Mean age 4.3 years	Maternal a) pressure to eat b) restriction c) monitoring (all measured by the Child Feeding Questionnaire)* plus d) modelling of healthy eating (answers to 3 items on modelling healthy eating measured using a 5-point Likert scale)	(1) Children's eating behaviours (using items from the food responsiveness and food fussiness subscales of the Child Eating Behaviour Questionnaire (CEBQ)* Items measured: -food fussiness -food responsiveness -interest in food (2) child BMI z-scores	(a) Pressure to eat at baseline inversely predicted child interest in food at follow up (b) and (c) Restriction and monitoring did not predict changes in child eating behaviour (d) modelling of healthy eating at baseline inversely predicted child food fussiness at follow up Maternal feeding	NR	NR	Eating behaviour at baseline, child age, gender, maternal age, BMI, education	None

						practices did not prospectively predict child food responsiveness or BMI				
Feeding styles										
	Bergmeier et al (2015) AMSTAR 2 confidence rating: critically low									
Feeding practices or styles and child weight	PCS (Lumeng et al, 2012) (1218) USA	15, 24, 36 months	Age 36 months	(a) Assertive prompting (verbal or physical encouragements) (b) Intrusiveness defined as maternal behaviour that was adult centred rather than child-centred and imposed the mother's agenda on the child At each of the 3 ages, children and their mothers	Height and weight by objective measures during laboratory visits Age 15 months: weight-to-length z score (WLZ)* Ages 24 and 36 months: BMI z-score (BMIz)* WLZ and BMIz collectively referred to	Assertive prompting and intrusive style had small but significant associations with greater child adiposity.	NR	NR	Child's ethnicity, sex, age family income-to-needs ratio, maternal education, weight status and depressive symptoms	Mostly white participants Quantitative data not reported by SR

				were filmed in a laboratory while the child ate a standardised snack; maternal feeding behaviours were observed and coded.	as adiposity z scores*					

Table A8.36 Obesity and childhood growth trajectory outcomes

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Rapid early weight gain or growth										
	Brisbois et al (2012) AMSTAR 2 confidence rating: critically low									
Rapid early growth and adult BMI	PCS (McCarthy et al 2007) (679) UK	2 to 5 years	Age 18 to 50 years*	Growth velocity (weight gain) measured as the deviance from the average predicted growth rate (kg per year) converted into z scores*	Adult BMI	Association between higher growth velocity and adult BMI (association NR)	NR	<0.001	All models adjusted for adult age, child sex and gestational age. Model 2 additionally adjusted for parental height and weight. Model 3 additionally adjusted for SES. Model 4 additionally	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									adjusted for maternal smoking in pregnancy. Model 5 additionally adjusted for current adult smoking status.	
Rapid early growth and adult BMI	PCS (Terry et al 2007) (261) USA	1 to 7 years	Age 20 to 40 years	Rapid growth (defined as an increase in percentile rank across 2 major reference growth percentiles as defined by the Centers of Disease Control and Prevention	Adult BMI	Rapid growth age 1 to 7 predicted higher adult BMI at 20 and 40 years (no effect size)	NR	Not provided	Maternal BMI, maternal weight gain during pregnancy, birth weight, postnatal growth rate (percentile change) at birth-age 4m, and age 4m-1y	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				growth charts)*						
Age at adiposity rebound (AR)										
	Brisbois et al (2012) AMSTAR 2 confidence rating: critically low									
Early AR and adult BMI	PCS (Freedman et al 2001) (626) USA	<5 years	Unclear	Early adiposity rebound	Unclear	Positive association (no effect size)	NR	<0.001	Unclear	None
Early AR and adult BMI	PCS (Prokopec et al 1993) (158) Czech Republic	<5 years	18 years*	Early adiposity rebound	Adult BMI*	Positive association (no effect size)	NR	<0.05	Unadjusted	None
Early AR and adult BMI	PCS (Rolland-Cachera) (164) France	<5 years	21 years*	Early adiposity rebound (under age 5 years) versus late adiposity rebound	Adult BMI*	Positive association (no effect size)	NR	(females: p<0.01; males: p<0.01)	Unadjusted	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				(older than 7 years)						
Early adiposity rebound and adult obesity	PCS (Williams et a 2009) (458) New Zealand	<5.5 years	Age 26 years	Early adiposity rebound (age <5.5 years) vs later adiposity rebound (age >5.5 to 7 years)	Risk of developing adult obesity	RR 5.91	3.03 to 11.55	NR	Adjusted for sex	None
Child BMI or obesity										
	Brisbois et al (2012) AMSTAR 2 confidence rating: critically low									
Child obesity and adult obesity	PCS (Garn et al, 1985) (383) USA	1 to 5 years	NR	Childhood obesity (classified as being in the ≥85th percentile)*	Adult obesity	Childhood obesity associated with adult obesity (RR of 1.77)	NR	p<0.05	Unadjusted	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Child BMI and adult obesity	PCS (Gasser et al, 1995) (232) France	Early childhood BMI (ages not stated)	NR	Child BMI	RR of becoming a heavy adult*	Increase in RR (details not NR)	NR	NR	Unadjusted	None
Child obesity and adult obesity	PCS (Guo et al, 2002) (347) USA	3 years	Age 35 years	BMI	Obesity	Females with obesity (BMI ≥ 30) at age 35 years had a higher BMI at age 3 ($p<0.05$) than females without obesity at age 35 years. BMI at age 3 did not differ between males with or without	NR	NR	Unadjusted	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						obesity at age 35 years.				
Child BMI and adult BMI	PCS (Kindblom et al 2009) (612) USA	1 to 4 years	Unclear	BMI	Unclear	Correlation in boys only (male only cohort)	NR	NR	Age*	None
Child BMI and adult BMI	PCS (Kubo et al, 2007) (244) Japan	3 months to 5 years	Unclear	BMI	Adult BMI*	Correlation in girls only (female only cohort)	NR	NR	Unadjusted	None
Child BMI and adult overweight	PCS (Magarey et al, 2003) (155) Australia	2 years	Age 20 years	BMI	Adult overweight (BMI ≥25kg/m^2)*	RR 2.72 Overweight at 20 years	NR	NR	Parental weight status*	None
Child BMI and adult BMI	PCS McCarthy et al, 2007) (679) UK	1.5 years	Unclear	BMI	BMI	Not significant correlation	NR	Not significant	Adult age, sex, and gestational age (model 1; unclear which	None

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									results of 4 models was cited by Brisbois)*	
Child obesity and adult obesity	PCS (Prokopec et al, 1993) (158) Czech Republic)	1 year	Age 18 years	‘Lean’ children BMI <25th percentile versus ‘Fat’ children BMI >75thth percentile*	Adult BMI >75th percentile ‘defined as ‘fat’ in the primary study	Childhood ‘fatness’ associated with adult ‘fatness’ (RR 1.8)	NR	NR	Unadjusted	None
Child overweight or obesity and adult overweight or obesity	PCS (Rolland-Cachera et al, 1987) (102) France	1 year	Age 20 years	BMI >75th percentile ‘defined as ‘fat’ in the primary study	Adult BMI >75th percentile ‘defined as ‘fat’ in the primary study	Childhood ‘fatness’ associated with adult ‘fatness’ (RR 2.0)	NR	NR	Unadjusted	None
Child BMI and adult BMI	PCS (Siervogel et al, 1999) (459) USA	>2 years and >5 years	NR	BMI	Adult BMI	Significant log OR with high adult BMI	NR	NR	Unadjusted	None

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Child BMI and adult BMI	PCS (Williams et al, 2001) (925) New Zealand	3 years and 5 years	Age 21 years*	BMI	Adult BMI*	Correlation	NR	<0.05	Unadjusted	None

Table A8.37 Child BMI and other health outcomes in later life

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Type 2 diabetes										
	Llewellyn et al (2016b) AMSTAR 2 confidence rating: low									
Child BMI and Type 2 diabetes	Subgroup MA (1 estimate from 1 PCS) (n and country not reported)	≤6 years	NR	BMI	Type 2 diabetes	OR 1.23	95% CI 1.10 to 1.37	NR	NR	None
Coronary heart disease										
	Llewellyn et al (2016b) AMSTAR 2 confidence rating: low									
Child BMI and coronary heart disease	Subgroup MA (3 estimate from 3 PCS) (n and country not reported)	≤6 years	NR	BMI	Coronary heart disease	OR 0.97	95% CI 0.85 to 1.10	NR	NR	I^2=52%;

Exposure and Outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Stroke										
	Llewellyn et al (2016b) AMSTAR 2 confidence rating: low									
Childhood BMI and stroke	Subgroup MA (3 estimate from 3 PCS) (n and country not reported)	≤6 years	NR	BMI	Stroke	OR 0.94	95% CI 0.75 to 1.19	NR	NR	I^2=58%
Breast cancer										
	Llewellyn et al (2016b) AMSTAR 2 confidence rating: low									
Childhood BMI and breast cancer	Subgroup MA (1 estimate from 1 PCS) (n and country not reported)	≤6 years	NR	BMI	Breast cancer	OR 0.88	95% CI 0.67 to 1.16	NR	NR	None

Table A8.38 Free sugars intake and dental caries

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Moynihan and Kelly (2014) AMSTAR 2 confidence rating: high									
Free sugars intake and dental caries	PCS (Battelino et al, 1997) (820) Argentina	4 years	1 year	Sucrose intake FFQ and 24 hour recall interview with the mother or teacher at beginning, middle and end of study and the average intake taken	Change in dmft and dmfs (measured using the WHO criteria)	Correlation coefficient 0.4	NR	NR	NR	None
Free sugars intake and dental caries	PCS (Rodrigues et al, 1999) (510) Brazil	3 years	1 year	Added sugars Sugars intake at school: 2 x 3-day weighed food records conducted by an	Caries increment (assessed using WHO caries criteria)	OR 2.99 of having a high caries increment in children who consumed >10% energy	1.82 to 4.91	<0.001	Family income, baseline age, household size, tooth brushing, daily intake of sugars at home, use of fluoride gel	No power calculation

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
				independent observer Sugars intake at home: 24h recall interview with the mother; 10% of interviews repeated to test reliability of 24h recall data		(32.6g) from added sugars per day compared with children consuming <10% energy from added sugars			and visiting the dentist	
Free sugars intake and dental caries	PCS (MacKeown et al 2000) (259) South Africa	1 year	4 years	Added sugars Semi-quantitative FFQ (authors state that it was validated)	dmfs	Change in caries incidence and prevalence was not significantly associated with added sugars intake	NR	NR	None	No power calculation

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						Prevalence of dental caries increased from 1.5% at age 1 (when sugars intake equated to 17g per day or approximately 6% energy intake) to 62.2% at age 5 years (when sugars intake was 48g per day and >10% of energy				

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						intake – approximately 14.4% EI)				
Free sugars intake and dental caries	PCS (Karjalainen et al 2001) (135) Finland	3 years	3 years	Sucrose 4-day food diary completed by the mother and day care staff	dmft (measured using WHO criteria) caries incidence	Sucrose intake of children who developed caries by age 6 years was 10.2 (SD 3.1) % EI vs 8.9 (SD 3.6) % EI in children who remained caries free	NR	0.026	No differences between children who were caries free and those who developed caries in tooth brushing habits, use of fluoride tables, day care use or maternal educational level; all participants came from a low fluoride area	No power calculation
	Baghlaf et al (2018) AMSTAR 2 confidence rating: high									

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Free sugars intake and dental caries	PCS (Gao et al 2010) (1782) Singapore	3 to 6 years	1 year	Bedtime sweet intake every night Parent-administered survey*	dmft (WHO diagnostic criteria)*	OR 1.33	1.00 to 1.68	NR	Frequency of between-meal sweets, plaque index, toothbrushing and fluoride	
	Hooley et al (2012b) AMSTAR 2 confidence rating: critically low									
Sugars-containing foods and drinks intake and dental caries	PCS (Fontana et al 2011) (329) USA	18 to 36 months	12 months*	Dietary habits (including consumption of sugars-containing foods and drinks) collected by questionnaire (unspecified)*	Presence of at least one new lesion (ICDAS score of ≥3), one new filling or progression of a lesion from a score of 3 or 4 to ≥5*	Association between snacking on non-fresh fruits and popcorn and ECC (data NR)	NR	NR	Multiple variables, including measures of SES and toothbrushing*	None
Sugars-containing foods and drinks intake	PCS (Ohsuka et al 2009) (188) Japan	Mean age 1.6 years	3 years	Snack-eating frequency – data obtained from questionnaires filled out by mothers*	Caries prevalence or incidence, dmft*	Association between frequent consumption of sweet foods and	NR	NR	Sex, living with grandparents, birth order, toothbrushing by parents, use of milk bottles, snack-	None

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
and dental caries						ECC (data NR)			eating time and frequency, average daily milk intake, daytime caring person*	
Sugars-containing foods and drinks intake and dental caries	PCS (Meurman and Pienihakkinen, 2010) (366) Finland	18 months	42 months (3.5 years)	Sugars added (sometimes vs never) – data obtained from interview of caregivers using a 4-level Likert scale*	Caries increment, dmft*	Sugars added at 18 months associated with caries increment at 42 months: OR 2.2*	1.1 to 4.5*	0.024*	Frequency of consumption of drinks other than water, frequency of night-feeding, frequency of sweet snacks consumption, mutans streptococci colonisation of teeth, caretaker occupation, oral health of both parents*	None

Table A8.39 Breastfeeding and dental caries

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Tham et al (2015) AMSTAR 2 confidence rating: low									
Breastfeeding duration and ECC risk	PCS (Chaffee et al 2014) (715 pregnant women; 537 children included in analysis) Brazil	<6 months 6 to 11 months 12 to 23 months ≥24 months	Age 38 months	Breastfeeding duration	Severe-ECC (S-ECC) at 38 months S-ECC: ≥1 affected maxillary teeth or ≥4 dmfs	Prevalence ratio (PR) of S-ECC Marginal structural models (fully-adjusted)*: <6m = 1 (ref) 6-11m = 1.77 (1.12 to 2.85)* 12-23m = 1.82 (0.85 to 3.20)* ≥24m = 2.10 (1.50 to 3.25) Regression models	See previous column	NR	Maternal age, education, parity, pre-pregnancy BMI; smoking status, social class, child age, sex, time-varying bottle use, feeding habits, length-for-age z scores Interactions: high frequency day time breastfeeding, and long duration high frequency	None

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						(fully-adjusted): <6m = 1 (ref) 6 to 11 months = 1.45 (0.83 to 2.53) 12 to 23 months = 1.39 (0.73 to 2.64) ≥24 months = 1.85 (1.11 to 3.08)				
Breastfeeding duration and ECC risk	PCS (Tada et al 1999) (392) Japan	18 months	Age 3 years	Breastfeeding at 18 months vs no breastfeeding at 18 months	dmft	OR 6.65 Incremental increase in caries in upper anterior teeth	2.89 to 15.2	<0.05	None	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
Breastfeeding duration and ECC risk	PCS (Tanaka et al 2013) (315) Japan	6 to 11 months, 12 to 17 months, ≥18 months versus <6 months	Age 41 to 50 months	Breastfeeding duration (defined as length of the period during which infants received breastmilk, regardless of exclusivity*)	ECC Presence of ≥ 1 dft (missing teeth excluded)	Adjusted OR of ECC <6 months = 1 (ref) 6 to 11 months = 0.67 (0.27 to 1.62) 12 to 17 months = 1.09 (0.45 to 2.71) ≥18 months = 2.47 (0.95 to 6.59)	0.76 to 2.16	NR	Bottle use for sweetened liquids other than milk, bottle-feeding while falling asleep, age of introduction of foods (in months), maternal age at baseline, maternal smoking during pregnancy, family income, paternal and maternal educational level, child's sex, birth weight, age at first tooth eruption, tooth-brushing frequency,	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
									fluoride use, dental check-up frequency, household smoking, age at oral examination*	
Breastfeeding duration and ECC risk	PCS (Yonezu et al 2006) (592) Japan	18 months, 24 months	Age 3 years	Breastfeeding (any) at 18 months versus no BF	dft	(a) Mean dft of children being breastfed at 18 months (0.36) greater than children not being breastfed at 18 months (0.06) (b) Mean dft of children being	NR	(a) and (b) <0.05	None	None

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
						breastfed at 24 months (0.51) greater than not being breastfed at 24 months (0.11)				
	Hooley et al (2012b) AMSTAR 2 confidence rating: critically low									
Breastfeeding duration and ECC risk	PCS (Cogulu et al, 2008) (56) Turkey	>12 months	2 years	Breastfeeding duration	ECC	No association (data NR)	NR	NR	None	None

Table A8.40 Use of bottles for milk feeds and dental caries

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Hooley et al (2012b) AMSTAR 2 confidence rating: critically low									
Bottle milk feeds and dental caries	PCS (Yonezu et al 2006) (592) Japan	≥18 months*	2 years*	Bottle-feeding (contents not specified) at ≥18m*	Caries incidence*	No association (data NR)	NR	NR	None	None
Bottle milk feeds and dental caries	PCS (Cogulu et al 2008) (56)* Turkey	>12 months*	24 months*	Use of bottles for feeding (containing sweetened milk*)	Caries incidence*	No association (data NR)	NR	NR	None	None

Table A8.41 Milk or dairy consumption and dental caries

Exposure and outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Dror and Allen (2014) AMSTAR 2 confidence rating: critically low									

Milk and dental carries	PCS (Marshall et al, 2003) (642) USA	1 to 3 years	Age 4 to 7 years	Median milk intakes	Surface and tooth level dental carries	Median milk intakes at age 2 to 3 years was lower in children with surface and tooth level dental caries	NR	<0.05	*Age at dental exam, sex, fluoride exposure, and dietary variables	None
Non-milk dairy and dental carries	PCS (Marshall et al, 2003) (642) USA	1 to 3 years	Age 4 to 7 years	Low or high cumulative (below or above median) non-milk dairy	Surface and tooth level dental carries	Low cumulative non-milk dairy associated with fewer surface caries compared with higher cumulative median) non-milk dairy consumption	NR	<0.01	*Age at dental exam, sex, fluoride exposure, and dietary variables	None

Table A8.42 Night time bottle feeding (milk) and dental caries

Exposure and Outcome	Study type (n participants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Hooley et al (2012b) AMSTAR 2 confidence rating: critically low									
Night time bottle feeding (milk) and dental caries	PCS (Gao et al 2010) (1576) Singapore	3 to 6 years	12 months*	Putting child to sleep with a bottle of milk	Caries development in primary teeth*	Associated with increased caries development (data NR)	NR	NR	Age and gender, frequency of between-meal sweet foods or drink intake, sweet intake at bedtime, toothbrushing frequency and duration per toothbrushing session*	None
Night time bottle feeding (milk) and dental caries	PCS (Ohsuka et al 2009) (188) Japan	Mean age 1.6 years	3 years*	Putting child to sleep with a bottle of milk	Caries incidence, dmft*	Associated with increased caries development (data NR)	NR	NR	Sex, living with grandparents, birth order, toothbrushing by parents, use of milk bottles, snack-eating time and frequency, average daily milk intake, daytime caring person*	None

Table A8.43 Breastfeeding or use of bottles for feeding and malocclusion risk

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Thomaz et al (2018) AMSTAR 2 confidence rating: moderate									
Breastfeeding ≥12 months and malocclusion risk	Subgroup MA (3 estimates from 3 PCS) (419) Brazil, Argentina and USA	Breastfeeding ≥12 months	Age 3 to 5 years (2 studies); data unavailable for the 3rd study*	Breastfeeding duration ≥12 months vs breastfeeding <12 months	Malocclusion risk	OR 0.38	0.24 to 0.60	<0.0001	1 out of 3 estimates was adjusted for confounding (non-nutritive sucking habits the only one specified by the SR as a key confounder)	Random-effects I^2=0%
Breastfeeding ≥12 months and malocclusion risk (overjet)	Subgroup MA (2 estimates from 2 PCS) (272) Brazil and USA	Breastfeeding ≥12m	Age 3 to 5 years	Breastfeeding duration ≥12 months vs breastfeeding <12 months	Malocclusion risk (overjet)	OR 0.30	0.16 to 0.57	=0.0003	1 out of 2 estimates was adjusted for confounding (non-nutritive sucking habits the only one specified by the SR as a key confounder)	Random-effects I^2=0%

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Hermont et al (2015) AMSTAR 2 confidence rating: moderate									
Use of bottles for feeding ≥12 months and malocclusion risk	PCS (Moimaz et al 2014) (80) Brazil	12 and 30 months	Age 30 months	Bottle feeding at (a) 12 months (b) 30 months	Malocclusion risk (posterior crossbite)	NR	NR	(a) 0.02 (b) 0.04	None	33% of cohort lost to follow-up

Table A8.44 Body weight and dental caries

Exposure and outcome	Study type (n partici-pants) Country	Baseline age	Follow up	Exposure	Outcome	Measure of association or effect	95% CI	p-value	Variables adjusted for	Comments
	Hooley et al (2012a) AMSTAR 2 confidence rating: low									
BMI and dental caries	PCS (Ismail et al, 2009) (788) USA (low-income African American households)	Mean age 2.6	2 years	Weight-for-age percentiles computed according to the 2000 US Centers for Disease Control and Prevention growth charts and grouped into quartiles*	Dental caries (dmfs)	Higher caries (dmft: 1 to 6) associated with higher weight-for-age (that is, the children in the highest weight-for-age quartile had significantly greater risk of caries than children in the lowest quartile*)	NR	NR	Predictors included frequency of soda consumption, asthma diagnosis, gender, dental visits, toothbrushing, baseline caries, parental mental health, SES*	None

Annex 9: Evidence grading

The evidence grading process for exposure-outcome relationships with at least 3 primary studies (intervention or prospective cohort studies) in children aged 1 to 5 years included in systematic reviews (with or without meta-analyses) are presented in Tables A9.1 to A9.28. Exposure-outcome relationships for which there were fewer than 3 primary studies were automatically graded *insufficient* and are listed in Table A9.29.

Dietary Energy

Table A9.1 Portion sizes on children's food and energy intake

Outcome	Food and energy intake
Number of SR	3 SRs
Number of primary studies included in SR	6 intervention studies (Ward: 1 pre-post study; Mikkelsen: 2 quasi-experimental; Osei-Assibey: 1 non-randomised controlled trial, 2 within-subject crossover design)
Results of primary studies	All 6 intervention studies (in childcare or preschool settings) reported that serving larger portion sizes increased food consumption (grams or kcal) compared with serving smaller portion sizes. One study reported that doubling an age-appropriate portion size of macaroni and cheese increased consumption (in grams) by 25% ($p<0.001$) and energy intake (kcal) by 15% ($p<0.01$). A second study reported that energy intake from snack foods increased with increasing portion size (small portion mean energy intake: 84 kcal vs large portion mean energy intake: 99 kcal; $p<0.05$). A third study reported that children ate more snack foods when allowed to self-select compared with when served a standard portion (MD 0.87 portions; $p<0.01$). A fourth study reported that decreasing the energy density of a dish served as part of a school meal by 30% decreased children's energy intake from the dish by 25% and overall lunch energy intake by 18%. The other 2 studies (1 on whole lunch meal, 1 on high fat sugar foods served during lunch) did not report quantitative data.
Quality of SR - AMSTAR 2 - Study power - Publication bias - Confounding	AMSTAR 2: Ward: moderate. Mikkelsen and Osei-Assibey: low. Study power: SRs did not include information on study power. Publication bias: SRs did not investigate publication bias. Confounding: assessed but findings NR (2 SRs); unclear whether confounding was assessed (1 SR).
Primary study characteristics	Total number of participants: 436 Study size: n≤40 (4 studies); n=235 (1 study). Study duration: 3-4 sessions (2 studies); 5 days (1 study); 3 months (1 study); 54 days (1 study). Baseline age: 2 to 5 or 7 (2 studies); 3 to 5 or 6 (2 studies); preschool age not defined (1 study).
Effect or association	↑

Outcome	Food and energy intake
Grade	Moderate
Justification for grade	Evidence graded *moderate* based on the consistent direction of findings from primary studies included in the 3 SRs, and large effect size. Evidence downgraded from *adequate* due to non-randomised study designs, small sample sizes, lack of confidence intervals, and lack of information on study power, publication bias, and confounding.

Abbreviations: prospective cohort study (PCS), mean difference (MD), not reported (NR), systematic review (SR)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.2 Dietary energy and obesity outcomes

Outcome	BMI
Number of SR	2 SRs
Number of primary studies included in SR	4 PCS (Parsons: 3 PCS, reported in 4 publications; Rouhani: 1 PCS)
Results of primary studies	Two PCS reported no association between energy intake (EI) at age 2, 3 to 5 years, and BMI 2 years later. A 3rd PCS reported a direct association between change in EI from age 4 to 6 and BMI at age 8 but no association with change in EI before age 4. The 4th PCS, in children aged 3 to 4 years with a follow-up duration of 12 years, reported an inverse association in girls only (10 girls) and no association in boys.
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: critically low (both SRs) Study power: neither SR included information on study power Publication bias: Rouhani: publication bias not detected for BMI using Begg's adjusted rank correlation test. Parsons: not assessed. As energy intake was not included in its search terms or strategy, its literature search cannot be said to be comprehensive for this exposure. Confounding: Rouhani: assessed confounding as part of risk of bias assessment. Parsons: confounding not assessed. The 2 PCS that reported an association (in either direction) did not adjust for confounding (except SES, in 1 of 2 analyses). The 2 PCS that reported no association adjusted for key confounding factors (sex, age and baseline BMI and physical activity).
Primary study characteristics	Total number of participants: 884 Study size: n<50 (1 PCS), n>100 (2 PCS), n>500 (1 PCS) Duration of follow up: 2 to 12 years Baseline age: 2 years (2 PCS); 3 to 4 or 5 years (2 PCS)
Other comments	Uncertain role of TDEI in any relationship between total fat intake and body weight or BMI
Effect or association	N/A
Grade Justification for grade	Insufficient Results from 4 PCS were inconsistent. The evidence was downgraded to *insufficient* due to the poor quality of the SRs, small sample sizes of the PCS, and inadequate consideration of confounding by the PCS.

Abbreviations: body mass index (BMI), prospective cohort study (PCS), socioeconomic status (SES), systematic review (SR), TDEI (total dietary energy intake)

↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.3 Total carbohydrate intake and obesity outcomes

Outcome	BMI
Number of SR	2 SRs
Number of primary studies included in SR	3 PCS (Hornell: 1 PCS; Parsons: 2 PCS)
Results of primary studies	1 study reported an inverse association (unadjusted for TDEI); the other 2 studies reported no association (adjusted for TDEI).
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: Hornell: moderate; Parsons: critically low. Study power: Hornell: considered as part of its quality assessment. Parsons: not assessed. Publication bias: not assessed (both SRs). As neither SR included ‘carbohydrate intake’ in their search terms or strategy, the literature search for this exposure cannot be said to be comprehensive. Confounding: Hornell: assessed as part of quality assessment. Parsons: not assessed. All 3 PCS adjusted for baseline child BMI and parental BMI; 2 of 3 studies adjusted for sex
Primary study characteristics	Total number of participants: 328 Study size: n=70, 112 and 146. Duration of follow-up: 2 years (1 PCS) and 6 years (2 PCS) Baseline age: 2 years (1 PCS); 2 to 8 years (1 PCS); 3 to 5 years (1 PCS)
Effect or association	Inconsistent
Grade Justification for grade	Insufficient Evidence downgraded to insufficient due to conflicting findings, uncertain role of TDEI, and literature searches that were unlikely to be comprehensive for this exposure.

Abbreviations: body mass index (BMI), socioeconomic status (SES), prospective cohort study (PCS), systematic review (SR), total dietary energy intake (TDEI)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.4 Sugars-sweetened beverages and obesity outcomes

Outcome	Odds of overweight or obesity	Change in BMI (or BMIz or WHZ)
Number of SR or MA	1 SR (with MA)	2 SRs
Number of primary studies included in SR/MA	7 estimates from 5 PCS included in the MA; 7225 participants	7 PCS (Frantsve-Hawley: 5 PCS; Luger: 2 PCS)
Results of MA or primary studies	MA reported an increased odds of being overweight or obese between the highest and lowest SSB intakes (servings per day or per week) OR 1.55; 95% CI 1.32 to 1.82 All point estimates in the same direction, with overlapping confidence intervals 4 of 5 PCS adjusted for TDEI	All 5 PCS (in 29,481 participants) reported a direct association (all unadjusted for TDEI). 2 PCS (in 1381 participants) reported null association (adjusted for TDEI)
Quality of SR or MA • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: moderate Statistical approach: random-effects model Heterogeneity: I^2=0 Study power: no information on study power (both SRs) Publication bias: not assessed Confounding: confounders were acknowledged, but impact of potential confounding bias not assessed. 4 of 5 studies adjusted for baseline BMI or body weight. Other confounders adjusted for by most studies included age, sex, dietary intake and physical activity.	AMSTAR 2: Frantsve-Hawley: moderate; Luger: low Study power: no information on study power (both SRs) Publication bias: not assessed (both SRs) Confounding: Of the 5 PCS reporting a direct association, all 5 adjusted for sex, 4 studies adjusted for SES, but only 1 study adjusted for baseline body size (WHZ).
Primary study characteristics	Sample size: n=120 to 548 (4 PCS), n=7157 (1 PCS)	Sample size: n<100 (2 PCS), n>200 (1 PCS), n=500 to 2000 (2 PCS), n>4000 (1 PCS), n>9000 (1 PCS), n>10000 (1 PCS)

Outcome	Odds of overweight or obesity	Change in BMI (or BMIz or WHZ)
	Follow-up duration: 1 to 8 years (4 studies ≤2 years). Baseline age: mostly under 5 years. 84.7% weighting of MA in children aged 1 to 5 years.	Follow-up duration: 6 months to 12 years Baseline age: mostly 2 to 5 years
Effect or association	↑	↑ (unadjusted for TDEI) N/A (adjusted for TDEI)
Grade Justification for grade	Adequate Evidence graded adequate based on the large association (OR 1.55; 95% CI 1.32 to 1.82), lack of heterogeneity between studies, and adequate accounting for key confounding factors	Moderate Evidence for a direct association between SSB consumption and change in BMI (or BMIz or WHZ), unadjusted for TDEI, graded *moderate* based on 5 large and moderate quality PCS with consistent findings. Given that most of the PCS did not adjust for baseline body size, upgrading to *adequate* was not warranted. Insufficient evidence for any association between SSB consumption and change in weight status, adjusted for TDEI, because only 2 PCS adjusted for TDEI.

Abbreviations: body mass index (BMI), body mass index z-score (BMIz), meta-analysis (MA), odds ratio (OR), prospective cohort study (PCS), randomised-controlled trial (RCT), systematic review (SR), total dietary energy intake (TDEI), weight-for-height z-score (WHZ)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.5 Total fat intake and obesity outcomes

Outcome	Change in body weight or BMI (shorter-term: 1-3 years follow up)	Change in BMI (longer-term: 6-14 years)
Number of SR	1 SR	2 SRs
Number of primary studies included in SR	4 PCS 1 PCS reported 2 outcome measures (body weight and BMI)	3 PCS Naude: 2 PCS; Parsons: 1 PCS
Results of primary studies	All 4 PCS reported no association (3 adjusted or 1 not adjusted for TDEI), although in 1 study the finding (adjusted for TDEI) was borderline statistically significant (p=0.05). Of the 2 PCS for which quantitative data were available, 1 PCS that compared higher total fat intake (>30% energy) vs lower total fat intake (≤30% energy) reported a mean difference (MD) in change in body weight of 0.2kg per year (95% CI -0.26 to 0.66), and MD in change in BMI of 0.02kg/m^2 per year (95% CI -0.26 to 0.30). The other PCS reported change in BMI of 0.034kg/m^2 (95% CI not reported) per 1% higher energy from total fat (p=0.05).	2 of 3 PCS reported a direct association, unadjusted for TDEI (although 1 study did not report statistics). The 3rd PCS reported no association (adjusted for TDEI).
Quality of SR - AMSTAR 2 - Study power - Publication bias - Confounding	AMSTAR 2: low Study power: SR included information on sample size justification (where available). 1 of 4 PCS reported a sample size justification. Publication bias: not assessed due to insufficient number of studies for this outcome. Confounding: assessed as part of risk of bias assessment. 3 of 4 PCS accounted for TDEI and key potential confounding factors (sex, ethnicity, baseline BMI, SES).	AMSTAR 2: Naude: low; Parsons: critically low Study power: Naude: SR included information on sample size justification if available. 1 of 4 PCS reported a sample size justification. Parsons: no information provided. Publication bias: Naude: not assessed due to insufficient number of studies for this outcome. Parsons: not assessed. As dietary fat intake was not included in its search terms or strategy, its literature search cannot be said to be comprehensive for this exposure. Confounding: Naude: assessed confounding as part of risk of bias assessment. Parsons: not assessed. 2 PCS adjusted for baseline BMI.

Outcome	Change in body weight or BMI (shorter-term: 1-3 years follow up)	Change in BMI (longer-term: 6-14 years)
Primary study characteristics	Total number of participants: 1234 Study size: 3 of 4 PCS had 130 to 220 participants; 1 PCS had 740 participants (and justified its sample size) Duration of follow-up: 1 to 3 years Baseline age: mostly 3 to 4 years	Total number of participants: 294 Study size: n=112 (2 PCS), n=70 (1 PCS) Duration of follow-up: 6 to 14 years Baseline age: 2 years (1 PCS); 3 years (1 PCS); 2 to 8 years (1 PCS)
Other comments	Significant imbalance in participant numbers between groups in 1 study Uncertain role of TDEI in any relationship between total fat intake and body weight or BMI	N/A
Effect or association	Null	N/A
Grade Justification for grade	Limited Evidence was downgraded to limited due to wide confidence intervals, and uncertain role of TDEI	Insufficient Evidence was downgraded to insufficient due to inconsistency in the findings and the uncertain role of TDEI.

Abbreviations: body mass index (BMI), mean difference (MD), prospective cohort study (PCS), randomised-controlled trial (RCT), socioeconomic status (SES), systematic review (SR), total dietary energy intake (TDEI)

↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.6 Total protein intake and obesity outcomes

Outcome	BMI
Number of SR	2 SRs
Number of primary studies included in SR	5 PCS Hornell: 4 PCS; Parsons: 1 PCS
Results of primary studies	All 5 PCS reported a direct association; 3 of 5 studies adjusted for TDEI. 2 PCS also reported a direct association between protein intake (% energy) at ages 1-2 and overweight at ages 5 (p=0.05, 1 PCS) and 7 years (OR 2.39; 95% CI 1.14 to 4.99, 1 PCS).
Quality of SR AMSTAR 2 Study power Publication bias Confounding	AMSTAR 2: Hornell: moderate; Parsons: critically low. Study power: Hornell: considered as part of its quality assessment. Parsons: study power not considered. Publication bias: not assessed (both SRs). Parsons: not assessed. As protein intake was not included in its search terms or strategy, its literature search cannot be said to be comprehensive for this exposure. Confounding: Hornell: confounding assessed as part of quality assessment. Parsons: confounding not assessed. All 5 PCS adjusted for multiple confounding factors. 3 of 5 PCS adjusted for sex and baseline BMI; 2 of 5 studies adjusted for SES; 3 of 5 studies adjusted for intakes of other macronutrients (as % energy in 2 studies; and absolute intake in grams in 1 study); 4 of 5 studies adjusted for parental BMI.
Primary study characteristics	Total number of participants: 659 Study size: 4 of 5 studies had <150 participants. In 1 study, 60% of the cohort was lost to follow up. Duration of follow-up: 4 of 5 studies had follow-up durations of >4 years Baseline age: 12 months (2 PCS); 17-18 months (1 PCS); 2 years (1 PCS); 2 to 8 years (1 PCS)
Other comments	Quantitative details not reported for 3 of 5 studies Uncertain role of TDEI in this relationship
Effect or association	↑
Grade Justification for grade	Moderate

	For BMI: there are consistent findings in 5 PCS of moderate quality. The uncertain role of TDEI in this relationship prevented grading the evidence as adequate. For overweight: there were only 2 PCS hence this was graded as insufficient.

Abbreviations: body mass index (BMI), odds ratio (OR), prospective cohort study (PCS), randomised-controlled trial (RCT), systematic review (SR), total dietary energy intake (TDEI)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.7 Animal protein intake and timing of puberty

Outcome	Age of menarche or voice break
Number of SR	1 SR
Number of primary studies included in SR	3 PCS
Results of primary studies	All 3 PCS reported an inverse association between animal protein intake at age 3 to 5 years and age at menarche or voice break; in 1 PCS the association did not reach statistical significance (p=0.06); 1 study reported that girls with animal protein intakes 1 SD above the mean reached menarche 0.63 years earlier than girls with intakes below 1 SD; no quantitative data available for the third study
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: moderate Study power: SR considered study power as part of its quality assessment. None of the 3 PCS performed or reported performing power calculations Publication bias: not assessed Confounding: assessed as part of the quality assessment. 2 of 3 PCS adjusted for TDEI or a measure of body size
Primary study characteristics	Total number of participants: 3457 Study size: n=67, 92 and 3298
Other comments	Data in 1 PCS from participants born in the 1930s to 1940s potentially limiting the generalisability of the findings to young children today
Effect or association	↓
Grade	Limited

Justification for grade	Evidence graded limited based on a limited number of primary studies included in the SR (3 PCS).

Abbreviations: prospective cohort study (PCS), standard deviation (SD), systematic review (SR), total dietary energy intake (TDEI)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Micronutrients

Table A9.8. Iron fortification and serum ferritin

Outcome	Serum ferritin (children with anaemia or high prevalence of anaemia)
Number of SR	2 SRs
Number of primary studies included in SR	3 trials (Matsuyama: 2 RCTs; Pratt: 1 randomised trial)
Results of primary studies	1 RCT reported no difference in change from baseline for serum ferritin (unadjusted for CRP) between intervention milk and control milk groups after 6 months intervention. 1 RCT reported an increase in serum ferritin (unclear whether adjusted for CRP) in the intervention milk group compared with the control milk group after 1 year intervention. 1 randomised trial reported no change in serum ferritin (adjusted for CRP) in the group that received iron-fortified micronutrient powder after 4 months' intervention. However, as all comparison groups in this trial received iron (at different doses), there was effectively no control group.
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: Matsuyama: moderate; Pratt: critically low Study power: no information on study power Publication bias: not assessed (both SRs) Confounding: Matsuyama: noted if there were imbalances at baseline between groups that could affect outcomes.
Primary study characteristics	Intervention strategy: fortification with iron and other micronutrients (zinc and vitamin A in all 3 trials). Fortificants were milk or formula (2 trials) and porridge powder (1 trial) Sample size: n=115, 750, 2666

Outcome	Serum ferritin (children with anaemia or high prevalence of anaemia)
	Study duration: 4 months (1 trial), 6 months (1 trial), 12 months (1 trial) Baseline age: 20 to 36 months
Other comments	Studies conducted in UMIC (2 trials) and LMIC (1 trial) ITT analysis (1 trial); PP analysis (2 trials) Bias from funding sources of the 2 milk studies: low or unclear risk
Effect or association	N/A
Grade Justification for grade	Insufficient Evidence downgraded due to: - 1 trial had no control group - lack of information on study power and lack of assessment of publication bias - adjustment for CRP (inflammation) either not done or unclear - indirectness of interventions (all examined the effect of iron fortification with other micronutrients) - unclear generalisability of findings to UK population

Abbreviations: C-reactive protein (CRP), intention-to-treat (ITT), lower middle income country (LMIC), per protocol (PP), randomised-controlled trial (RCT), systematic review (SR), upper middle income country (UMIC)

↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.9. Iron fortification and prevalence of anaemia

Outcome	Anaemia prevalence (children with anaemia or high prevalence of anaemia)
Number of SR	1 SR
Number of primary studies included in SR	3 trials (2 cluster-RCTs, 1 RCT)
Results of primary studies	All 3 trials reported a reduction in the prevalence of anaemia after 2 to 12 months' intervention. Both cluster-RCTs reported a greater reduction in anaemia prevalence in the intervention group than in the control group after 2 and 12 months' treatment (treatment effect: p=0.02 in 1 study; p<0.001 in the second study), with adjustment for cluster effects. The RCT also reported a greater reduction in anaemia prevalence in the intervention group after 6 months' treatment (41% to 12%; p<0.001) compared with the control group (30% to 24%; p=0.40). It also reported that treatment with the fortified milk intervention was inversely associated with being anaemic after 6 months' intervention (p<0.03) although it is unclear what the outcome measure (RR or OR) was.
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: critically low Study power: no information on study power Publication bias: not assessed Confounding: not assessed
Primary study characteristics	Intervention strategy: fortification with iron and other micronutrients (zinc, vitamin A and vitamin C in all 3 trials; folic acid in 2 trials). Milk was used in 2 trials and micronutrient powder ('Sprinkles') in 1 trial Sample size: n=115, 795, 2283 Study duration: 2 months (1 trial); 6 months (1 trial); 12 months (1 trial) Baseline age: 6 to 36 months
Other comments	Studies conducted in UMIC (2 trials) and LMIC (1 trial) PP analysis (3 trials) Both cluster-RCTs adjusted for cluster effects Bias from funding sources of the milk studies not assessed

Outcome	Anaemia prevalence (children with anaemia or high prevalence of anaemia)
Effect or association	↓
Grade Justification for grade	Limited Evidence downgraded due to: - PP analysis could overestimate effect sizes - lack of assessment of publication bias or potential bias from funding sources - indirectness of interventions (all examined the effect of iron fortification with other micronutrients) - unclear generalisability of findings to UK population

Abbreviations: C-reactive protein (CRP), lower middle income country (LMIC), per protocol (PP), randomised-controlled trial (RCT), systematic review (SR), upper middle income country (UMIC)

↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.10 Vitamin D fortification (of milk or formula) and vitamin D status

Outcome	Vitamin D status
Number of SR or MA	1 SR
Number of primary studies included in SR or MA	3 RCTs
Results of primary studies	All 3 RCTs reported that vitamin D-fortified milk or formula increased serum vitamin D or decreased the risk of vitamin D deficiency (defined as serum 25(OH)D <50nmol/l in the studies) compared with the control group (non-fortified cows' milk in 2 RCTs, red meat in 1 RCT). Only 1 RCT assessed the intervention effect in the context of seasonal shifts in vitamin D status (winter versus summer months in Northern Europe). Quantitative data was not reported for any of the studies. Average (mean or median) baseline vitamin D status of the children in the intervention groups in the 3 RCTs ranged from 54 to 70nmol/l.
Quality of SR or MA • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: critically low Study power: not assessed Publication bias: not assessed. However, as 'vitamin D' was not included in the search strategy of the SR, the literature search for this exposure cannot be said to be comprehensive. Confounding: not assessed
Primary study characteristics	Total number of participants: 635 Study size: n=92, 225 and 318 Duration of follow-up: 20 weeks (2 RCTs), approximately 6 months (1 RCT) Baseline age: 12 to 20 months (1 RCT); 1 to 3 years (1 RCT); 2 to 6 years (1 RCT) Countries: HIC (UK, Germany, the Netherlands and New Zealand)
Other comments	Main research question of SR was to evaluate the nutritional composition of 'Young child formula' (that is formula milks targeted at children aged 1 to 3 years) and their nutritive role in European children. SR did not quality assess included studies ITT analysis (1 RCT), PP analysis (1 RCT), analysis unclear (1 RCT) 2 of 3 RCTs funded by industry

Effect or association	↑
Grade	Limited
Justification for grade	Evidence downgraded due to the lack of quantitative data to judge effect sizes and confidence intervals, a literature search that is not comprehensive for vitamin D as an exposure or intervention, and lack of accounting for possible bias from industry funding of the RCTs.

Abbreviations: randomised-controlled trial (RCT), systematic review (SR), high income country (HIC)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Foods, dietary components, and dietary patterns

Table A9.11 Fruit juice and BMI

Outcome	Change in BMI (or BMI z-score)
Number of SR	1 SR
Number of primary studies included in SR	6 PCS
Results of primary studies	3 PCS (in 10,938 participants) reported a direct association (including a dose-response association in 1 study), all unadjusted for TDEI; 3 PCS (in 16,854 participants) reported no association, of which 2 adjusted for TDEI
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: moderate Study power: no information on study power Publication bias: not assessed Confounding: 3 of 3 studies that reported a direct association adjusted for sex, baseline BMI or weight, ethnicity or SES; while 2 of 3 studies that reported no association adjusted for sex and baseline BMI
Primary study characteristics	Total number of participants: 27,792 Study size: two studies had <110 participants; 3 studies had between 800 and 1350 participants; 3 studies had between 8950 to 15,400 participants Duration of follow-up: The studies that reported an association had longer follow-up durations (mostly 2 to 6 years) than the studies that reported no association (6m to 2 years). Baseline age: mostly 2 to 4 years
Effect or association	↑ (non-TDEI adjusted) Null (TDEI-adjusted)
Grade Justification for grade	Limited Unadjusted for TDEI: 3 of 3 PCS of moderate quality reported a direct association between fruit juice consumption and BMI – the evidence was graded limited. Adjusted for TDEI: 3 of 3 PCS reported no association between fruit juice consumption and BMI – the evidence was also graded limited.

Abbreviations: body mass index (BMI), prospective cohort study (PCS), socioeconomic status (SES), systematic review (SR), total dietary energy intake (TDEI)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.12 Total dairy and BMI

Outcome	BMI
Number of SR	1 SR
Number of primary studies included in SR	3 PCS
Results of primary studies	2 PCS reported an inverse association. The third study PCS reported no association
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: low Study power: no information on study power Publication bias: not assessed Confounding: 3 of 3 studies that reported a direct association adjusted for sex, baseline BMI or weight, ethnicity or SES; while 3 of 4 studies that reported no association adjusted for sex and baseline BMI
Primary study characteristics	Total number of participants: 789 Study size: range 92 to 362 participants Duration of follow-up: 8 years follow up Baseline age: 18 months to 3 years
Other comments	Two of the 3 studies used a dataset from the same longitudinal cohort study.
Effect or association	N/A
Grade Justification for grade	Insufficient Evidence graded insufficient because only 2 independent PCS

Abbreviations: body mass index (BMI), prospective cohort study (PCS), socioeconomic status (SES), systematic review (SR)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.13 Milk and BMI

Outcome	BMI
Number of SR	1 SR
Number of primary studies included in SR	5 PCS
Results of primary studies	All 5 PCS reported no association Only 2 of the PCS reported effect size and standard errors, the other 3 PCS only reported p-values
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: low Study power: no information on study power Publication bias: not assessed Confounding: All 5 studies adjusted for sex and demographic factors (ethnicity); 4 studies adjusted for SES; 3 studies adjusted for energy and nutrient intake variables; 2 studies adjusted for age and baseline anthropometric factors; additional potential confounders were parental feeding styles, change in height, milk type, television viewing, maternal BMI and education, paternal BMI;
Primary study characteristics	Total number of participants: 20,418 Study size: n= 852, 8300, 8950 participants Duration of follow-up: from 1 to 5 years Baseline age: 1 to 5 years
Effect or association	Null
Grade Justification for grade	Moderate All 5 PCS reported no association; evidence was graded moderate rather than adequate due to the lack of confidence intervals and inconsistency in adjustment for confounders.

Abbreviations: body mass index (BMI), prospective cohort study (PCS), socioeconomic status (SES), systematic review (SR)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.14 Diet quality ('unhealthy' dietary pattern) and body fat

Outcome	Body fat
Number of SR	1 SR
Number of primary studies included in SR	3 PCS
Results of primary studies	Two studies found a positive association (in 292 and 4750 participants); the third study (in 585 participants) reported the same association only in boys and no association for girls although the direction of the association was the same
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: moderate Study power: no information on study power presented in primary studies (the SR attempted to extract the information on study power) Publication bias: not assessed Confounding: All studies adjusted for age; two also adjusted for sex, maternal education, maternal BMI and TDEI; other potential confounders (non-consistent) included body composition measures, socioeconomic status, birth weight, gestational age, pubertal status, physical activity, other dietary patterns
Primary study characteristics	Total number of participants: 5627 Study size: n=292, 585 and 4750 Duration of follow-up: from age 4.8 to 18 years Baseline age: 3 to 4.8 years
Effect or association	↑
Grade Justification for grade	Limited The evidence was graded as limited as there were 3 PCS with some evidence for the same direction of association.

Abbreviations: body mass index (BMI), prospective cohort study (PCS), socioeconomic status (SES), systematic review (SR)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.15 Diet quality (‘Unhealthy’ dietary pattern) and IQ

Outcome	IQ
Number of SR	1 SR
Number of primary studies included in SR	3 PCS
Results of primary studies	All studies found inverse association
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: critically low Study power: no information on study power presented in primary studies (the SR attempted to extract the information on study power) Publication bias: not assessed Confounding: All studies adjusted for maternal age, education, social class, marital status; Two studies adjusted for maternal tobacco smoking during pregnancy, family income, ethnicity, number of children (<16 years old) living in the family home; One study adjusted for age at IQ testing, duration of breastfeeding, other dietary pattern scores, HOME score, housing tenure and life events
Primary study characteristics	Total number of participants: 12,984 Study size: n=1366, 3966 and 7652 participants Duration of follow-up: age of 8 and 15 years Baseline age: 6 months to 4 years
Other comments	2 of 3 studies used a dataset from the same longitudinal cohort study
Effect or association	↓
Grade Justification for grade	**Insufficient** Evidence graded insufficient because there were only 2 independent PCS

Abbreviations: intelligence quotient (IQ), prospective cohort study (PCS), systematic review (SR)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.16 Feeding practices (collective)* on increasing consumption of fruit or vegetables

Outcome	Vegetable consumption (short term, <12 months)
Number of SR or MA	2 SRs with MAs
Number of primary studies included in MA	Hodder: 13 RCTs, 1741 participants Nekitsing: 30 intervention studies (12 RCTs, 6 cross-over, 6 between-subjects, 3 within-subjects, 3 pre-post designs), 4017 participants
Results of MA	Hodder: SMD 0.33; 95% CI 0.13 to 0.54; p=0.0014 (equivalent to an increase of 3.50g of as-desired vegetable consumption).12 of 13 point estimates favoured the intervention with overlapping confidence intervals. Hodder: sensitivity analysis after exclusion of 8 studies at high risk of bias: SMD 0.23; 95% CI 0.03 to 0.44; p=0.026. Hodder: sensitivity analysis of 8 studies with low attrition or high attrition with ITT analysis: SMD 0.29; 95% CI 0.10 to 0.48; p=0.002. Nekitsing MA of 30 studies: SMD 0.40; 95% CI 0.31 to 0.50; p<0.001. 29 of 30 effect estimates favoured the intervention with overlapping confidence intervals. Nekitsing MA of 44 intervention arms across 30 studies: SMD 0.42; 95% CI 0.33 to 0.51; p<0.001
Quality of SR or MA • AMSTAR 2 • Statistical approach • Heterogeneity • Study power • Overlap of primary studies • Publication bias • Confounding	AMSTAR 2: Hodder: moderate; Nekitsing: low Statistical approach: random-effects model (both MAs). Nekitsing: pooled results from different study types (RCTs, between-subjects, within-subjects, pre-post designs) Heterogeneity: Hodder: I^2=70%; Nekitsing: I^2=73.4% (MA 30 studies); I^2=69.1% (MA of 44 intervention arms) Study power: Hodder: noted whether RCTs included information on study power. Nekitsing: no information provided Overlap of primary studies: Nekitsing: 3 of 30 studies in Hodder. Publication bias: Hodder: high probability of publication bias. Nekitsing: Funnel plot asymmetry and results of Egger's test suggested presence of publication bias. Imputing estimates from missing studies would reduce the overall effect size to SMD 0.31 (95% CI 0.21 to 0.41). Confounding (NRSI): Nekitsing: 23 of 30 studies were rated 'strong' on confounding using the Effective Public Health Practice Project quality assessment tool (3 of 30 were rated 'moderate', 4 of 30 rated 'weak')

Outcome	Vegetable consumption (short term, <12 months)
Primary study characteristics	Study size: Hodder: 4 of 13 RCTs, n<50; 5 of 13 RCTs, n>100; 2 of 13, n>600; 2 of 13, n=unclear. Nekitsing: n=12 to 902 across the 30 studies. Study duration: Hodder: <6 months; Nekitsing: ≤8 months Baseline age: Hodder: ≤5 years; Nekitsing: mean age 3.8 years (from 19 studies that reported mean age)
Effect or association	↑
Grade Justification for grade	Moderate Findings from the main MA by Hodder et al (2018) was supported by sensitivity analyses by Hodder et al (2018) and the findings from the MA by Nekitsing et al (2018). Evidence of publication bias together with a small effect size, and non-specificity of interventions (varied feeding practices) prevented the evidence from being graded *adequate*.

Abbreviations: intention-to-treat (ITT), meta-analysis (MA), non-randomised studies of intervention (NRSI), randomised controlled trial (RCT), standardised mean difference (SMD), systematic review (SR)

↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

*Repeated exposure (6 studies), pairing with positive stimuli (3 studies) and infant feeding practices (4 studies)

Table A9.17 Repeated taste exposure on increasing vegetable consumption

Outcome	Vegetable consumption (short term, <12 months)
Number of SR or MA	1 SR with MA
Number of primary studies included in subgroup MA	10 intervention studies (study design not specified) in subgroup MA, participants NR
Results of subgroup MA	SMD 0.57; 95% CI 0.43 to 0.70; p=NR. Meta-regression analysis of the 10 studies: Beta coefficient 0.035; 95% CI 0.00 to 0.06; p=0.01 Children require 8 to 10 exposures for a significant improvement in vegetable consumption
Quality of SR or MA • AMSTAR 2 • Statistical approach • Heterogeneity • Study power • Publication bias • Confounding	AMSTAR 2: low Statistical approach: random-effects model Heterogeneity: I^2=52% Study power: no information on study power Publication bias: funnel plot asymmetry and results of Egger's test suggested presence of publication bias. Confounding (NRSI): confounding assessed but unclear to what extent the studies included in the subgroup MA were subject to confounding.
Primary study characteristics	Study duration: ≤8 months Study size: unclear Baseline age: <5 years (mean age NR)
Other comments	MA pooled results from different study types (RCTs, between-subjects, within-subjects, pre-post designs)
Effect or association	↑
Grade Justification for grade	Moderate Evidence of publication bias prevented the evidence from being graded adequate.

Abbreviations: meta-analysis (MA), not reported (NR), non-randomised studies of intervention (NRSI), randomised controlled trial (RCT), standardised mean difference (SMD), systematic review (SR)

↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.18 Repeated taste exposure and pairing versus control on increasing vegetable consumption

Outcome	Vegetable consumption (short term, <12 months)
Number of SR or MA	1 SR with MA
Number of primary studies included in subgroup MA	8 intervention arms (study design not specified) in subgroup MA, 358 participants
Results of subgroup MA	SMD 0.43; 95% CI 0.26 to 0.61; p=NR.
Quality of SR or MA • AMSTAR 2 • Statistical approach • Heterogeneity • Study power • Publication bias • Confounding	AMSTAR 2: low Statistical approach: random-effects model Heterogeneity: I^2=NR Study power: no information on study power Publication bias: funnel plot asymmetry and results of Egger's test suggested presence of publication bias. Confounding (NRSI): confounding assessed but unclear to what extent the studies included in the subgroup MA were subject to confounding bias
Primary study characteristics	Study duration: ≤8 months Study size: unclear Baseline age: <5 years (mean age NR)
Other comments	Pooled results from different study types (RCTs, between-subjects, within-subjects, pre-post designs)
Effect or association	↑
Grade Justification for grade	Moderate Evidence of publication bias together with small effect sizes prevented the evidence from being graded *adequate*.

Abbreviations: meta-analysis (MA), not reported (NR), non-randomised studies of intervention (NRSI), randomised controlled trial (RCT), standardised mean difference (SMD), systematic review (SR)

↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.19 Adult modelling on children’s food acceptance or consumption

Outcome	Food consumption
Number of SR	2 SRs
Number of primary studies included in SR	6 intervention studies Ward: 2 quasi-experimental studies; Mura Paroche: 3 intervention studies (study design not specified) and 1 PCS.
Results of primary studies	Of the 5 intervention studies: 2 quasi-experimental studies reported that modelling by teachers (silently or enthusiastically) did not increase acceptance or consumption of foods (including vegetables and fruit) compared with simple exposure; a third study reported that parental modelling (among other prompting techniques) did not increase consumption of an unfamiliar fruit or vegetable compared with a neutral prompt. Two additional studies reported that adult modelling was effective in increasing child acceptance or consumption of unfamiliar foods compared with simple exposure. One of these studies reported that the modelling effect did not differ by age or early feeding practices while the other study reported that the effect was strongest in girls and when the modeller was the child’s mother (rather than a ‘visitor’). The PCS reported that maternal modelling of healthy eating was inversely associated with child food fussiness 1 year later in adjusted analyses.
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: Ward: moderate; Mura Paroche: critically low. Study power: SRs did not include information on study power. Publication bias: SRs did not investigate publication bias. Confounding: Ward: confounding assessed but findings NR; Mura Paroche: unclear whether confounding was assessed.
Primary study characteristics	Study size: n<80 (4 studies); n<100 (1 study); n>100 (1 study) Study duration: 1 year (1 study); 3 days (1 study), unclear (4 studies). Baseline age: preschool age undefined (2 studies) 12 to 36 months (1 study), mean age 3.3 years (1 study) 14 to 48 months (1 study), 2 to 5 years (1 study).
Other comments	Mura Paroche: insufficient quantitative data to judge effect sizes.
Effect or association	Inconsistent
Grade Justification for grade	Inconsistent Three intervention studies reported no difference in effect on children’s food acceptance or consumption between adult modelling compared with simple exposure or a neutral prompt while 2 intervention studies reported that adult modelling

	increased children’s food acceptance or consumption compared with simple exposure or modelling of different foods (vs the target food). The PCS reported an inverse association between modelling of healthy eating and child food fussiness. All studies were short term (up to 1 year).

Abbreviations: not reported (NR), systematic review (SR)

↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.20 Peer modelling on children's food acceptance or consumption

Outcome	Food consumption
Number of SR	2 SRs
Number of primary studies included in SR	3 intervention studies Mikkelsen: 1 quasi-experimental study; Mura Paroche: 2 studies (study design not specified).
Results of primary studies	All 3 studies reported that peer modelling led to increased consumption or acceptance for the modelled food (fruit, vegetables, plain crackers) that were either unfamiliar (fruit), not preferred by the child at baseline (vegetable) or for which preference or acceptance status was not reported (crackers). One study reported that girl models were more effective than boy models at increasing acceptance of unfamiliar fruit in children (both genders) but the effect had disappeared 1 month after the study.
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: Mikkelsen: low; Mura Paroche: critically low. Study power: SRs did not include information on study power. Publication bias: SRs did not investigate publication bias. Confounding: Mikkelsen: confounding assessed but findings NR; Mura Paroche: unclear whether confounding was assessed
Primary study characteristics	Study size: n<40 (2 studies); n>50 (1 study) Study duration: 2 sessions (1 study), 4 days (1 study), unclear (1 study) Baseline age: 2 to 4 years (1 study), 3 to 6 years (1 study), 2.5 to 6.5 years (1 study)
Other comments	Mura Paroche: insufficient quantitative data to judge effect sizes.
Effect or association	N/A
Grade Justification for grade	Insufficient Evidence downgraded due to the lack of quantitative data to judge effect sizes, small sample sizes, and lack of information on study power, publication bias, and confounding.

Abbreviations: not reported (NR), systematic review (SR)

↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.21 Rapid early weight gain or growth and adult BMI

Outcome	Adult BMI
Number of SR	1 SRs
Number of primary studies included in SR	2 PCS
Results of primary studies	Both PCS found a direct association between rapid early growth at age 1 to 7 years and higher adult BMI.
Quality of SR - AMSTAR 2 - Study power - Publication bias - Confounding	AMSTAR 2: critically low Study power: SRs did not include information on study power Publication bias: SRs did not investigate publication bias Confounding: both PCS adjusted for potential confounding factors including sex, gestational age, maternal weight, maternal smoking and SES.
Primary study characteristics	Total number of participants: 940 Study size: n=679 and 261 Study duration: Ages at follow up were ages 18 to 50 years (1 PCS) and 20 to 40 years (1 PCS) Baseline age: 1 to 7 years
Effect or association	N/A
Grade Justification for grade	Insufficient Evidence graded as insufficient due to number of PCS

Abbreviations: body mass index (BMI), not reported (NR), prospective cohort study (PCS), SES (socioeconomic status), systematic review (SR)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.22 Age at adiposity rebound and adult BMI or risk of obesity

Outcome	Adult BMI or risk of obesity
Number of SR	1 SR
Number of primary studies included in SR	4 PCS
Results of primary studies	All 4 PCS reported an inverse association. One PCS reported a RR for obesity at age 26 years of 5.91 per year earlier rebound (95% CI 3.03 to 11.55); the magnitude of the association was not reported for the other 3 PCS
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: critically low Study power: SRs did not include information on study power Publication bias: SRs did not investigate publication bias Confounding: one PCS adjusted for sex, the other 3 PCS were unadjusted
Primary study characteristics	Total number of participants: 1406 Study size: n=158, 164, 458 and 626 Study duration: The duration of follow-up was not reported for 3 out of 4 studies, but to be included in the SR primary studies had to have an outcome measure in adulthood (>18 years) Baseline age: under 5.5 years
Effect or association	↓
Grade Justification for grade	Limited Evidence was graded limited due to the small number of studies (4 PCS) of limited quality (no study adjusted for the key confounder baseline BMI)

Abbreviations: body mass index (BMI), prospective cohort study (PCS), relative risk (RR), socioeconomic status (SES), systematic review (SR)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.23 Child BMI or weight status and adult BMI, overweight or obesity

Outcome	Adult BMI, overweight or obesity
Number of SR	1 SR
Number of primary studies included in SR	11 PCS
Results of primary studies	All 10 of 11 PCS reported a direct association with adult BMI. 4 of 10 reported that a higher BMI in childhood was associated with a higher risk of adult overweight or obesity. 2 PCS were male only cohorts and one was a female only cohort. In 1 PCS there was an association in girls but not boys
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: critically low Study power: SRs did not include information on study power Publication bias: SRs did not investigate publication bias Confounding: 8 PCS were unadjusted for potential confounding factors. 1 PCS was 'adjusted' but details were not provided, 1 adjusted for age, 1 adjusted for parental weight status and one adjusted for family income, pre-gestational weight, maternal height, weight gain during pregnancy and age
Primary study characteristics	Total number of participants: 4296 Study size: 3 PCS had <200 participants, 5 PCS had 200 to 500 participants, and 3 had >500 Study duration: follow up for 4 PCS was at ages 18 to 35 years; NR or unclear for the other 7 PCS Baseline age: 3 months to 5 years
Other comments	Statistics or quantitative details were reported for 5 of 11 PCS
Effect or association	↑
Grade Justification for grade	Adequate Evidence was graded adequate due to the large number of studies (10 PCS), large study sizes in several PCS (3 n>500) and the consistent direction of the results. Adjusting for confounding factors is unnecessary for a predictive association. However, the lack of optimal adjustments limits the ability to make causal inferences.

Abbreviations: body mass index (BMI), not report (NR), prospective cohort study (PCS), systematic review (SR)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.24 Child BMI and adult coronary heart disease

Outcome	Adult coronary heart disease
Number of SR or MA	1 SR with MA
Number of primary studies included in subgroup MA	3 PCS
Results of subgroup MA	Subgroup MA reported no association (OR: 0.97; 95% CI: 0.85 to 1.10)
Quality of SR or MA • AMSTAR 2 • Statistical approach • Heterogeneity • Study power • Publication bias • Confounding	AMSTAR 2: critically low Statistical approach: random-effects model Heterogeneity: medium heterogeneity (I^2=52%) Study power: SRs did not include information on study power Publication bias: SRs did not investigate publication bias Confounding: No information provided on adjustment for confounders. Authors stated that when available, results from models adjusted for potential confounders were used and that most studies were adjusted for key confounders, but no further details were provided on the degree of adjustment performed in these 3 PCS.
Primary study characteristics	Total number of participants: not reported Study size: not reported Study duration: not reported Baseline age: ≤6 years
Effect or association	Null
Grade Justification for grade	Moderate Evidence graded moderate based on the total number of primary studies included in the SR with MA (3 PCS)

Abbreviations: meta-analysis (MA), odds ratio (OR), prospective cohort study (PCS), systematic review (SR)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.25 Child BMI and adult stroke

Outcome	Adult stroke
Number of SR or MA	1 SR with MA
Number of primary studies included in subgroup MA	3 PCS
Results of subgroup MA	Subgroup MA reported no association (OR: 0.94; 95% CI: 0.75 to 1.19)
Quality of SR or MA • AMSTAR 2 • Statistical approach • Heterogeneity • Study power • Publication bias • Confounding	AMSTAR 2: critically low Statistical approach: random-effects model Heterogeneity: medium heterogeneity (I^2=58%) Study power: SRs did not include information on study power Publication bias: SRs did not investigate publication bias Confounding: No information provided on adjustment for confounders. Authors stated that when available, results from models adjusted for potential confounders were used and that most studies were adjusted for key confounders, but no further details were provided on the degree of adjustment performed in these 3 PCS
Primary study characteristics	Total number of participants: not reported Study size: not reported Study duration: not reported Baseline age: ≤6 years
Effect or association	Null
Grade Justification for grade	Moderate Evidence graded moderate based on the total number of primary studies included in the SR with MA (3 PCS) and the medium heterogeneity.

Abbreviations: meta-analysis (MA), odds ratio (OR), prospective cohort study (PCS), systematic review (SR)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Oral health

Table A9.26 Free sugars intake and dental caries

Outcome	Dental caries (increment, incidence, prevalence)
Number of SR	3 SRs
Number of primary studies included in SR	8 PCS (Moynihan and Kelly: 5 PCS; Baghlaf: 1 PCS; Hooley: 1 PCS)
Results of primary studies	7 of 8 PCS reported a direct association, with large effects in some: 1 PCS reported OR 2.99; 95% CI 1.82 to 4.91 for children who consumed >10% TDEI from free sugars; 1 PCS reported OR 1.33; 95% CI 1.01 to 1.68 for children who consumed sweets at bedtime without brushing their teeth. Only 1 PCS reported no association (unadjusted).
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: Moynihan and Kelly: high; Baghlaf: high; Hooley: critically low. Study power: Moynihan and Kelly: described whether studies had provided information on power or justified sample sizes (none of the 5 PCS had). Baghlaf and Hooley: no information provided. Publication bias: not assessed or considered (all SRs) Confounding: assessed as part of quality assessment (all SRs). 6 of 8 PCS (all reporting a direct association) adjusted for at least 1 key confounder (toothbrushing, fluoride use, SES).
Primary study characteristics	Total number of participants: 4389 Study size: All PCS >130 participants; 5 PCS with >300 participants Duration of follow-up: 4 PCS with 1 year follow-up; 4 PCS with 3 to 4 year follow-up Baseline age: 1 year (1 PCS); 18 months (3 PCS); 3 years (2 PCS); 4 years (1 PCS); 3 to 6 years (1 PCS)
Other comments	PCS conducted in HIC and UMIC
Effect or association	↑
Grade Justification for grade	Adequate Evidence graded adequate due to the large number of PCS showing consistent findings, large effect sizes (in some studies), and adequate accounting for key confounding factors.

Abbreviations: high income country (HIC), meta-analysis (MA), prospective cohort study (PCS), socioeconomic status (SES), systematic review (SR), total dietary energy intake (TDEI), upper middle income country (UMIC)

↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.27 Breastfeeding beyond 12 months and dental caries

Outcome	Early childhood caries (ECC)
Number of SR	2 SRs
Number of primary studies included in SR	5 PCS (Tham: 4 PCS; Hooley: 1 PCS). The 5 PCS compared different breastfeeding (BF) durations (8 comparisons in total)
Results of primary studies	2 of 2 PCS reported that BF for *12 months and longer* was not associated with later ECC/S-ECC risk compared with BF for <6 months; 1 PCS reported OR 1.39; 95% CI 0.73 to 2.64. One PCS adjusted for intake of sugars-containing foods and drinks, SES but not oral hygiene practices and fluoride use; the other study adjusted for use of bottles for feeding (sweetened liquids other than milk), night time bottle feeding, oral hygiene practices, fluoride use, SES but not intake of sugars-containing foods. 3 of 3 PCS reported that BF for *18 months and longer* was directly associated with ECC risk compared with not BF at 18 months. 1/3 PCS (which reported OR 2.47; 95% CI 0.95 to 6.59 compared with BF for <6 months) adjusted for confounding factors (although not intake of sugars-containing foods). 2 of 2 PCS reported that *BF for 24 months and longer* was directly associated with ECC risk compared with not BF at 24 months; 1 PCS reported PR 2.10; 95% CI 1.50 to 3.25. This PCS adjusted for intake of sugars-containing foods and drinks, and SES but not oral hygiene practices and fluoride use. The other study did not account for confounding.
Quality of SR • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: Tham: low; Hooley: critically low Study power: not considered (both SRs) Publication bias: not assessed (both SRs) Confounding: assessed as part of quality assessment (both SRs). See above for details of confounders at the individual study level
Primary study characteristics	Total number of participants: 1892 Study size: n>300 in all 4 PCS in Tham; n=56 in 1 PCS in Hooley Duration of follow-up: 14 months (1 PCS); 18 months (2 PCS); 2 years (1 PCS); 3 to 4 years (1 PCS)
Other comments	Studies conducted in HIC and UMIC
Effect or association	N/A
Grade	Insufficient

Justification for grade	Evidence downgraded to insufficient due to the inconsistency in findings, heterogeneity of BF durations and comparators and the limited adjustment for key confounding factors, particularly in studies on BF ≥18 months and ≥24 months, and unclear generalisability to the UK population.

Abbreviations: breastfeeding (BF), early childhood caries (ECC), high income country (HIC), meta-analysis (MA), prospective cohort study (PCS), socioeconomic status (SES), systematic review (SR), total dietary energy intake (TDEI), upper middle income country (UMIC)
↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Table A9.28 Breastfeeding beyond 12 months and malocclusion risk

Outcome	Malocclusion and overjet
Number of SR or MA	1 SR with MA
Number of primary studies included in subgroup MA	3 PCS (419 participants) included in a subgroup MA on malocclusion risk 2 of the 3 PCS (272 participants) also included in a subgroup MA on risk of overjet
Results of subgroup MA	Subgroup MA reported an inverse association (protective effect) and no heterogeneity for malocclusion (OR 0.38; 95% CI 0.24 to 0.60; $p<0.000$; $I^2=0$), and overjet (OR 0.30; 95% CI 0.16 to 0.57; $p=0.0003$; $I^2=0$)
Quality of SR or MA • AMSTAR 2 • Study power • Publication bias • Confounding	AMSTAR 2: moderate Study power: considered as part of quality assessment but not reported on. Publication bias: funnel plot asymmetry suggests publication bias favouring studies with significant results. Confounding: assessed as part of quality assessment. 1 of 3 PCS adjusted for non-nutritive sucking habits.
Primary study characteristics	Total number of participants: 419 Study size: n=119, 147 and 153 included in the subgroup MA on malocclusion risk. Duration of follow-up: participants followed up at ages 3 to 5 years
Other comments	2 of 3 PCS conducted UMIC, and 1 in HIC
Effect or association	↓ (protective effect)
Grade	Moderate

Justification for grade	Evidence graded moderate due to 3 PCS due to the large effect size and lack of statistical heterogeneity. Country of setting of the studies was not considered an important factor for this relationship.

Abbreviations: high income country (HIC), meta-analysis (MA), prospective cohort study (PCS), socioeconomic status (SES), systematic review (SR), upper middle income country (UMIC)

↑ increase in effect or direct association; ↓ decrease in effect or inverse association; null = no association or effect; N/A not enough evidence to draw conclusions and recommendations (in line with the SACN reports on Saturated fat and Lower carbohydrate diets), applicable to *inconsistent* and *insufficient* evidence

Summary of evidence graded insufficient due to insufficient number of primary studies included in the SRs (< 3 intervention or prospective cohort studies)

Table A9.29 Exposure-outcome relationships for which evidence was graded insufficient

Exposure or intervention	Outcome
Energy and macronutrients	
Energy intake	Body fat
Total carbohydrate intake	Body fat
Sugars-sweetened beverages	Body fat
Total fat intake	Body fat
	Linear growth (age at peak linear growth velocity, height)
	Blood pressure (systolic and diastolic blood pressure)
PUFA intake	BMI (risk of overweight)
	Body fat
	Blood lipids (serum total cholesterol, LDL cholesterol, HDL cholesterol, triacyglycerol)
	Blood pressure (systolic and diastolic blood pressure)
n-3 PUFA intake	BMI
	Body fat
	Blood lipids (serum total cholesterol, LDL cholesterol, HDL cholesterol, triacyglycerol)
	Blood pressure (systolic and diastolic blood pressure)
Protein intake (all sources)	BMI
	Body fat
	Growth (age at adiposity rebound, BMI at adiposity rebound)
	Timing of puberty (age of menarche, age of onset of pubertal growth spurt; age at peak linear growth velocity)
	Blood lipids (serum total cholesterol, LDL cholesterol, HDL cholesterol, triacyglycerol)
	Bone health
	Neurodevelopment
Animal protein intake	BMI

Exposure or intervention	Outcome
	Body fat
	Growth (peak linear growth velocity)
	Timing of puberty (age of onset of pubertal growth spurt; age at peak linear growth velocity)
Vegetable protein intake	BMI
	Body fat
	Growth (peak linear growth velocity)
	Timing of puberty (age of menarche or voice break; age of onset of pubertal growth spurt; age at peak linear growth velocity)
Micronutrients	
Iron fortification (with or without other micronutrients)	Hb concentration (in healthy children without anaemia or with anaemia)
	Serum ferritin (in healthy children without anaemia)
	Prevalence of iron deficiency anaemia (in children with anaemia)
	Prevalence of anaemia (in healthy children without anaemia)
Foods and dietary patterns	
Vegetables and fruit	BMI or body weight
Total dairy	Height
	Body fat
	BMI
	Bone mineral content
	Bone area
	Systolic blood pressure
	Diastolic blood pressure
	Verbal cognitive outcomes
Milk intake	Body fat
	Incident overweight
Skimmed/reduced fat milk intake	BMI
Full-fat milk intake	BMI
Yoghurt intake	Height
Cheese intake	Overweight or obesity
Cream/Crème fraiche intake	Overweight or obesity

Exposure or intervention	Outcome
Non-milk dairy	Dental caries
Breastfeeding beyond 12 months	Weight
	Height or length
	Cognitive development
	Psychological development
Diet quality	Receptive vocabulary
	non-verbal vocabulary
	IQ (‘healthy’ dietary pattern)
	Verbal IQ
	Key Stage 2 results
Other dietary patterns	IQ
	Verbal IQ
	Vocabulary
	Cognitive performance
Probiotics	Weight or WAZ
	Height or length or HAZ
	Weight for length
Non-nutritive sweeteners	BMI
	Islet autoimmunity
	Progression to type 1 diabetes
Eating and feeding behaviours	
Children’s eating behaviours: picky eating	BMI z-score, change in BMI or standardized weight, odds of underweight
Children’s eating behaviours: inability to delay gratification	Risk of overweight, change in BMI z-score
Children’s eating behaviours: skipping breakfast vs eating breakfast	Odds of overweight
Feeding practices: repeated taste exposure	Acceptance of textures
Feeding practices: repeated visual exposure	Preference or acceptance (Vegetables and fruit)
Feeding practices: parental restriction	Energy intake, child weight status
Feeding practices: use of rewards	Food acceptance or intake
Feeding practices: verbal encouragement	Food acceptance or intake
Feeding practices: choice offering	Food acceptance or intake

Exposure or intervention	Outcome
Feeding practices: exposure to sweet food	Preference or intake for sweet foods
Feeding practices: exposure to SSB or fruit juice	Intake of SSB or fruit juice
Feeding practices: pressuring child to eat	Child weight status
Feeding styles: responsive feeding	Child weight status
Feeding styles: non-responsive feeding	Child weight status
Obesity	
Child BMI	Adult diabetes
	Adult breast cancer
Oral health	
Bottle milk feeds beyond 12 months	Early childhood caries (ECC)
	Malocclusion risk
Night time bottle feeding (milk)	ECC
Dairy or milk intake	Dental caries
Body weight	ECC

Annex 10: Additional analyses of the National Diet and Nutrition Survey data

5. This Annex includes supplementary tables of data from additional analyses conducted on the latest dataset from the National Diet and Nutrition Survey rolling programme (NDNS RP) for the chapter on Micronutrients (Chapter 4).

6. This Annex also includes descriptive statistics for intakes of the full range of macronutrient and micronutrient intakes and blood analyte indicators of micronutrient status.

Table A10.1. Estimated average requirements (EAR), energy intakes and body weight for children aged 12 to 60 months (NDNS 2008/09 to 2018/19 and DNSIYC)

		Age groups									
		12 to 18 months		18 to 23 months		24 to 35 months		36 to 47 months		48 to 60 months	
		Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
EAR (MJ/day)[1]	Average	3.2	3.0	3.2	3.0	4.2	3.9	4.9	4.5	5.8	5.4
Energy intake (MJ/day)[2]	mean	4.16	3.97	4.45	4.07	4.74	4.38	4.91	4.78	5.62	5.06
	median	4.13	3.97	4.32	4.03	4.62	4.26	4.81	4.69	5.68	5.26
	SD	0.87	0.87	0.89	0.82	1.00	0.92	1.03	1.22	1.10	1.13
	2.5th percentile	2.36	2.33	3.01	2.38	2.89	2.98	2.92	2.36	3.78	2.90
	97.5th percentile	5.83	5.83	6.53	5.52	6.83	6.17	6.87	7.04	7.80	7.89
	% above EAR	*88*	*88*	96	87	69	69	47	58	43	*37*
	Number of participants	*641*	*634*	*141*	*129*	*299*	*255*	*277*	*274*	*235*	*219*
Body weight (kg)[2]	mean	11.2	10.6	*12.6*	*11.7*	*14.7*	*13.5*	*16.6*	*16.1*	*18.7*	*18.0*
	median	11.2	10.5	*12.6*	*11.8*	*14.3*	*13.4*	*16.5*	*15.8*	*18.6*	*17.4*
	SD	1.3	1.3	*1.61*	*1.56*	*3.09*	*1.53*	*2.32*	*2.48*	*2.44*	*3.11*
	2.5th percentile	8.9	8.1	*9.1*	*8.3*	*11.1*	*10.8*	*12.3*	*12.3*	*14.5*	*13.6*
	97.5th percentile	13.9	13.5	*.15.8*	*14.9*	*18.3*	*16.7*	*20.9*	*21.7*	*24.7*	*27.5*
	Number of participants	*619*	*609*	*123*	*110*	*256*	*232*	*242*	*250*	*225*	*210*

[1] Source: (SACN, 2011)

[2] Data from DNSIYC 2011 (Lennox et al, 2013) for children aged 12 to 18 months and NDNS RP years 1 to 11 (2008/09 to 2018/19) for children aged 18 to 60 months.

Table A10.2. Macronutrient intakes for children aged 12 to 60 months (NDNS 2016/17 to 2018/19 and DNSIYC)

Macronutrient		**Age groups**		
(Dietary recommendation)		**12 to 18 months[1]**	**18 to 47 months[2]**	**48 to 60 months[2]**
Protein[3] g/day (RNI:14.5g/day for age 1 to 3 years; 19.7g/day for age 4 to 6 years)	mean (g/day)	37.7	41.0	45.8
	median (g/day)	37.5	40.5	42.6
	SD (g/day)	10.2	10.0	14.8
	2.5th percentile (g/day)	19.1	23.0	25.0
	97.5th percentile (g/day)	58.4	62.5	73.4
	% above RNI	*99*	*100*	*100*
% energy[4]	mean (% energy)	15.6	15.7	15.0
	median (% energy)	15.7	15.4	14.4
	SD (% energy)	2.6	2.8	3.0
	2.5th percentile (% energy)	10.7	10.8	10.1
	97.5th percentile (% energy)	20.7	21.7	21.1
Total carbohydrate[5] g/day	mean (g/day)	126	138	168
	median (g/day)	125	136	158
	SD (g/day)	29	36	44
	2.5th percentile (g/day)	74	73	90
	97.5th percentile (g/day)	186	211	257
% energy[4] (DRV: 50% of total dietary energy for ages ≥2 years)	mean (% energy)	49.0	49.1	51.3
	median (% energy)	49.1	48.9	51.1
	SD (% energy)	5.8	5.9	5.4
	2.5th percentile (% energy)	37.8	37.9	40.8
	97.5th percentile (% energy)	60.6	61.0	60.8

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[1] Data from DNSIYC 2011 (Lennox et al, 2013).
[2] Data from NDNS 2016/17 to 2018/19.
[3] Protein Reference nutrient intakes (RNI) from (DH, 1991) and based on a body weight of 12.5kg and 17.8kg for children aged 1-3 years and 4-6 years, respectively.
[4] Total energy is equivalent to food energy as no alcohol is consumed in children of this age.
[5] Carbohydrate, free sugars and dietary fibre – Dietary reference values (DRV) from (SACN, 2015).

Macronutrient (Dietary recommendation)		**Age groups**		
		12 to 18 months[1]	**18 to 47 months**[2]	**48 to 60 months**[2]
	% meeting DRV[6]	*43*	*44*	*60*
Total sugars g/day	mean (g/day)	66.0	62.3	76.0
	median (g/day)	64.9	59.9	69.0
	SD (g/day)	18.6	22.6	25.3
	2.5th percentile (g/day)	30.7	23.3	32.4
	97.5th percentile (g/day)	107.2	108.7	137.2
% energy[4]	mean (% energy)	25.8	21.9	23.1
	median (% energy)	25.5	21.5	23.1
	SD (% energy)	5.6	5.4	4.6
	2.5th percentile (% energy)	15.1	12.4	13.8
	97.5th percentile (% energy)	37.6	32.7	32.1
Free sugars / NMES[5,7] g/day	mean (g/day)	19.8 (NMES)	27.9 (free sugars)	38.9 (free sugars)
	median (g/day)	17.2	24.6	34.3
	SD (g/day)	12.1	15.8	19.3
	2.5th percentile (g/day)	4.7	6.3	10.5
	97.5th percentile (g/day)	52.0	66.6	80.9
% energy[4] (DRV < 5% of total dietary energy for ages ≥2 years)	mean (% energy)	7.7	9.7	11.7
	median (% energy)	6.8	9.0	10.9
	SD (% energy)	4.5	4.6	4.6
	2.5th percentile (% energy)	1.9	2.9	4.8
	97.5th percentile (% energy)	19.9	20.5	21.4
	% exceeding DRV[6]	*72*	*85*	*97*

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[6] The DRVs for free sugars and fibre apply to children from the age of 2 years. However, for the purposes of reporting the age group 1.5 to 3 years, the recommendation has been applied to the whole group, including those aged under 2 years.

[7] In 2015, SACN recommended that a definition of ‘free sugars’ should be adopted in the UK for public health nutrition purposes to replace the concept of non-milk extrinsic sugars (NMES) on which sugar intake recommendations had been based since 1991 (SACN, 2015) DNSIYC estimated sugar intakes using the NMES definition while more recent NDNS survey used the definition of free sugars. The definition of free sugars is similar to that for NMES, the main difference is that NMES includes 50% of the sugar from canned, stewed, dried or preserved fruits was taken but free sugars includes none (Roberts et al, 2018).

Macronutrient (Dietary recommendation)		**Age groups**		
		12 to 18 months[1]	**18 to 47 months[2]**	**48 to 60 months[2]**
Dietary fibre[58] g/day (DRV: 15g/day age 2 to 4 years)	mean (g/day)	7.3 (NSP)	10.4 (AOAC)	12.6 (AOAC)
	median (g/day)	7.2	9.7	11.6
	SD (g/day)	2.7	3.5	4.7
	2.5th percentile (g/day)	2.5	4.7	4.8
	97.5th percentile (g/day)	13.1	17.7	24.1
	% not meeting DRV[2]	*N/A*	*88*	*72*
Fat[9] g/day	mean (g/day)	38.2	41.5	46.1
	median (g/day)	37.6	40.6	43.3
	SD (g/day)	10.6	11.5	13.8
	2.5th percentile (g/day)	18.1	22.7	23.2
	97.5th percentile (g/day)	60.1	63.7	79.4
% energy[4] (DRV: 33% total energy from fat for children over 5 years)	mean (% energy)	35.4	35.3	33.7
	median (% energy)	35.3	35.7	33.1
	SD (% energy)	5.0	4.9	4.7
	2.5th percentile (% energy)	25.6	24.4	25.3
	97.5th percentile (% energy)	45.1	43.5	44.0
	% exceeding DRV (≤33% energy)	69	69	53
Saturated fat[9] g/day	mean (g/day)	17.5	17.5	18.6
	median (g/day)	17.1	16.9	16.9
	SD (g/day)	5.8	6.1	6.9
	2.5th percentile (g/day)	7.3	7.3	9.2

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[8] The definition of AOAC fibre is dietary fibre which is measured by analytical AOAC methods. AOAC methods capture resistant starch and lignin in the estimation of total fibre, as well as non-starch polysaccharides (NSP) (Roberts et al, 2018). AOAC fibre intakes are in the region of 30% higher than NSP intakes.

[9] Fat (incl. fat saturated, monounsaturated and polyunsaturated fats). There are no recommendations for children under five years of age which state the proportions of dietary energy that should come from fat. (SACN, 2019)
Recommendations for fats for adults and children aged 5 years and older (DH, 1991; DH, 1994; SACN, 2019).Total fat: 35% food energy (33% total dietary energy); saturated fat: 11% food energy (10% total dietary energy); polyunsaturated fat: 6.5% food energy (6% total dietary energy); monounsaturated fat: 13% food energy (12% total dietary energy).

Macronutrient (Dietary recommendation)		**Age groups** **12 to 18 months**[1]	 **18 to 47 months**[2]	 **48 to 60 months**[2]
	97.5th percentile (g/day)	29.1	29.7	34.7
% energy[4] DRV ≤10% total energy for children over 5 years	mean (% energy)	16.3	14.8	13.5
	median (% energy)	16.3	14.7	13.1
	SD (% energy)	3.6	3.6	3.0
	2.5th percentile (% energy)	9.0	7.2	7.7
	97.5th percentile (% energy)	23.1	21.7	20.4
	% exceeding DRV (≤ 10% energy)[10]	*95*	*91*	*91*
Cis monounsaturated fat[9] g/day	mean (g/day)	12.4	14.0	16.2
	median (g/day)	12.2	13.4	15.6
	SD (g/day)	3.7	4.0	5.1
	2.5th percentile (g/day)	5.9	7.7	7.2
	97.5th percentile (g/day)	20.4	22.7	27.3
% energy [4]	mean (% energy)	11.5	12.0	11.9
	median (% energy)	11.3	11.7	11.7
	SD (% energy)	2.2	2.2	2.1
	2.5th percentile (% energy)	7.7	8.3	7.8
	97.5th percentile (% energy)	16.4	16.3	16.2

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[10] The recommendation applies to adults and children aged 5 years and older (SACN, 2019). However, for the purpose of this risk assessment, the recommendation has been applied to children aged under 5 years.

Macronutrient (Dietary recommendation)		**Age groups**		
		12 to 18 months[1]	**18 to 47 months[2]**	**48 to 60 months[2]**
Cis n-3 polyunsaturated fat[9] g/day	mean (g/day)	0.7	0.9	1.1
	median (g/day)	0.7	0.8	1.0
	SD (g/day)	0.3	0.5	0.4
	2.5th percentile (g/day)	0.3	0.4	0.5
	97.5th percentile (g/day)	1.4	2.1	2.0
% energy[4]	mean (% energy)	0.7	0.8	0.8
	median (% energy)	0.6	0.7	0.7
	SD (% energy)	0.2	0.4	0.3
	2.5th percentile (% energy)	0.3	0.3	0.5
	97.5th percentile (% energy)	1.2	1.7	1.5
Cis n6-polyunsaturated fat[9] g/day	mean (g/day)	4.0	5.1	6.0
	median (g/day)	3.9	4.7	5.4
	SD (g/day)	1.5	2.0	2.2
	2.5th percentile (g/day)	1.6	2.2	3.2
	97.5th percentile (g/day)	7.4	10.3	10.5
% energy[4]	mean (% energy)	3.7	4.3	4.5
	median (% energy)	3.6	4.1	4.2
	SD (% energy)	1.2	1.4	1.3
	2.5th percentile (% energy)	1.9	2.5	2.6
	97.5th percentile (% energy)	6.5	7.7	7.8
Trans fat[9] g/day DRV ≤2% total energy	mean (g/day)	0.6	0.6	0.7
	median (g/day)	0.6	0.6	0.6
	SD (g/day)	0.3	0.3	0.3
	2.5th percentile (g/day)	0.1	0.2	0.2
	97.5th percentile (g/day)	1.2	1.3	1.4
% energy[4]	mean (% energy)	0.5	0.5	0.5
	median (% energy)	0.5	0.5	0.5

Macronutrient (Dietary recommendation)		**Age groups**		
		12 to 18 months[1]	**18 to 47 months[2]**	**48 to 60 months[2]**
	SD (% energy)	0.2	0.2	0.2
	2.5th percentile (% energy)	0.2	0.1	0.2
	97.5th percentile (% energy)	0.9	0.9	1.0
	% exceeding recommendation	-	-	-
Salt[11] (< 2g/day age 1-3 years < 3g/day age 4-6 years)	mean (g/day)	2.3	2.7	3.2
	median (g/day)	2.2	2.6	2.9
	SD (g/day)	0.9	0.9	1.0
	2.5th percentile (g/day)	0.8	1.1	1.7
	97.5th percentile (g/day)	4.2	4.5	5.7
	% exceeding recommendation	*N/A*	*76*	*47*
	Number of participants	*1275*	*306*	*102*

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[11] Salt - Recommendation from (SACN, 2003). These target salt intakes do not represent ideal or optimum consumption levels, but achievable population goals. Calculated from data of average daily intake of sodium from all sources, including dietary supplements (conversion factor: 1g salt = 400mg sodium).

Table A10.3 Food group contributors to cis monounsaturated fatty acid (MUFA) intake for children aged 12 to 60 months[1]

Contribution of food groups [2,3,4] to cis MUFA intake	12 to 18 months		18 to 47 months		48 to 60 months	
	%	g/day	%	g/day	%	g/day
Milk and cream[5]	21.2	2.5	15.5	2.1	8.5	1.4
Infant formula[6]	14.6	1.9	1.7	0.2	0.0	0.0
Meat, meat products and dishes	12.2	1.6	17.1	2.4	22.5	3.6
Butter and fat spreads	7.9	1.0	8.4	1.2	9.4	1.5
Biscuits, buns, cakes, pastries, pies puddings	6.4	0.8	11.3	1.6	13.9	2.2
Cheese[5]	4.0	0.5	4.6	0.6	3.3	0.5
Commercial toddlers foods and drinks	3.4	0.4	0.6	0.1	0.7	0.1
Potatoes, potato products and dishes	3.2	0.4	3.8	0.6	5.6	1.0
Eggs, egg products and dishes	3.1	0.4	3.4	0.5	3.2	0.5
Crisps and savoury snacks	3.0	0.4	7.6	1.2	7.2	1.2
Yogurt, fromage frais and dairy desserts[5]	3.0	0.3	1.9	0.3	1.6	0.2
Fish, fish products and dishes	2.8	0.4	3.5	0.5	2.4	0.4
Breast milk	2.8	0.3	0.0	0.0	0.0	0.0
Pizza, pasta, rice, products and dishes	2.6	0.3	3.8	0.5	4.3	0.6
Sugar, preserves and confectionery	2.1	0.3	3.8	0.5	4.4	0.7
Bread	1.6	0.2	2.2	0.3	2.5	0.4
Vegetables, products and dishes	1.6	0.2	2.1	0.3	2.3	0.3
Breakfast cereals	1.4	0.2	2.4	0.3	2.2	0.4
Savoury sauces, pickles gravies and condiments	1.2	0.1	2.1	0.3	2.2	0.4
Soup	0.6	0.1	0.7	0.1	0.5	0.1
Fruit	0.6	0.1	1.0	0.2	0.5	0.1
Ice cream[5]	0.3	0.0	0.7	0.1	1.1	0.2
Nuts and seeds	0.2	0.0	1.5	0.2	1.7	0.3
Number of participants	1275		306		102	

[1] Data sources: DNSYIC (2011) for children aged 12 to 18 months; NDNS years 2016/17 to 2018/19 for children aged 18 to 60 months.

[2] Food groups are ordered by largest to smallest % contribution in the youngest age group.

[3] Food groups that contribute less than 0.5% of intake in all age groups are not presented.

[4] Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.

[5] Includes dairy alternatives.

[6] Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks.

Table A10.4 Food group contributors to cis n-3 polyunsaturated fatty acids (cis n-3 PUFA) intake for children aged 12 to 60 months[1]

Contribution of food groups [2,3,4] to cis n-3 PUFA intake	12 to 18 months		18 to 47 months		48 to 60 months	
	%	g/day	%	g/day	%	g/day
Infant formula[6]	12.9	0.1	1.4	0.0	0.0	0.0
Butter and fat spreads	11.6	0.1	13.4	0.1	13.6	0.1
Meat, meat products and dishes	10.5	0.1	15.1	0.1	17.4	0.2
Milk and cream[5]	9.4	0.1	6.6	0.1	3.5	0.0
Fish, fish products and dishes	7.8	0.1	8.9	0.1	7.0	0.1
Vegetables, products and dishes	7.2	0.1	6.1	0.1	7.5	0.1
Biscuits, buns, cakes, pastries, pies and puddings	5.1	0.0	8.3	0.1	10.8	0.1
Commercial toddlers foods and drinks	4.8	0.0	0.9	0.0	0.4	0.0
Potatoes, products and dishes	4.3	0.0	4.5	0.0	6.7	0.1
Fruit	4.2	0.0	4.3	0.0	4.7	0.0
Bread	3.4	0.0	5.2	0.1	4.9	0.1
Pizza, pasta, rice, products and dishes	3.1	0.0	4.5	0.0	4.7	0.0
Crisps and savoury snacks	2.5	0.0	3.6	0.0	3.6	0.0
Breast milk	2.5	0.0	0.0	0.0	0.0	0.0
Cheese[5]	2.0	0.0	2.2	0.0	1.3	0.0
Breakfast cereals	1.5	0.0	1.7	0.0	1.6	0.0
Savoury sauces pickles gravies and condiments	1.4	0.0	2.7	0.0	3.2	0.0
Eggs, egg products and dishes	1.4	0.0	2.4	0.0	2.4	0.0
Yogurt, fromage frais and dairy desserts[5]	1.4	0.0	0.9	0.0	0.8	0.0
Soup	1.3	0.0	1.0	0.0	0.7	0.0
Sugar preserves and confectionery	0.7	0.0	2.4	0.0	1.8	0.0
Nuts and seeds	0.4	0.0	2.3	0.0	1.4	0.0
Dietary supplements	0.2	0.0	0.9	0.0	1.3	0.0
Number of participants	1275		306		102	

[1] Data sources: DNSYIC (2011) for children aged 12 to 18 months; NDNS years 2016/17 to 2018/19 for children aged 18 to 60 months.
[2] Food groups are ordered by largest to smallest % contribution in the youngest age group.
[3] Food groups that contribute less than 0.5% of intake in all age groups are not presented.
[4] Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.
[5] Includes dairy alternatives.
[6] Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks.

Table A10.5 Food group contributors to cis n-6 polyunsaturated fatty acids (cis n-6 PUFA) intake for children aged 12 to 60 months[1]

Contribution of food groups [2,3,4] to cis n-6 PUFA intake	12 to 18 months		18 to 47 months		48 to 60 months	
	%	g/day	%	g/day	%	g/day
Infant formula[6]	14.7	0.7	1.4	0.1	0.0	0.0
Meat, meat products and dishes	11.7	0.5	16.9	0.8	21.2	1.3
Milk and cream[5]	8.8	0.3	6.2	0.3	3.6	0.2
Butter and fat spreads	8.6	0.4	9.4	0.5	9.0	0.5
Biscuits, buns, cakes, pastries, pies and puddings	7.0	0.3	10.7	0.5	11.7	0.7
Commercial toddlers foods and drinks	6.4	0.2	1.3	0.1	0.6	0.0
Potatoes, potato products and dishes	5.7	0.2	7.7	0.4	9.1	0.6
Bread	5.2	0.2	6.6	0.3	6.5	0.4
Breakfast cereals	4.6	0.2	4.7	0.2	4.4	0.3
Pizza, pasta, rice, products and dishes	4.4	0.2	5.1	0.2	5.5	0.3
Vegetables, products and dishes	4.1	0.2	4.1	0.2	4.7	0.3
Fish, products and dishes	3.7	0.1	4.3	0.2	2.8	0.2
Eggs, products and dishes	2.8	0.1	3.7	0.2	3.1	0.2
Crisps and savoury snacks	2.8	0.1	5.7	0.3	5.8	0.4
Breast milk	2.4	0.1	0.0	0.0	0.0	0.0
Savoury sauces, pickles, gravies and condiments	1.5	0.1	2.2	0.1	2.1	0.1
Sugar preserves and confectionery	1.1	0.0	2.5	0.1	2.6	0.2
Fruit	1.1	0.0	1.8	0.1	1.9	0.1
Yogurt, fromage frais and dairy desserts[5]	1.0	0.0	0.8	0.0	0.8	0.1
Cheese[5]	0.9	0.0	1.2	0.1	0.8	0.0
Soup	0.8	0.0	0.8	0.0	0.4	0.0
Nuts and seeds	0.5	0.0	2.3	0.2	2.6	0.2
Number of participants	1275		354		114	

[1] Data sources: DNSYIC (2011) for children aged 12 to 18 months; NDNS years 2016/17 to 2018/19 for children aged 18 to 60 months.

[2] Food groups are ordered by largest to smallest % contribution in the youngest age group.

[3] Food groups that contribute less than 0.5% of intake in all age groups are not presented.

[4] Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.

[5] Includes dairy alternatives.

[6] Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks.

Table A10.6 Food group contributors to trans fatty acids intake for children aged 12 to 60 months[1]

Contribution of food groups[2,3,4] to trans fatty acid intake	**12-18 months**		**18-47 months**		**48-60 months**	
	%	**g/day**	**%**	**g/day**	**%**	**g/day**
Milk and cream[5]	32.8	0.2	28.6	0.2	23.8	0.2
Meat, meat products and dishes	14.5	0.1	13.7	0.1	18.9	0.1
Cheese	13.7	0.1	15.9	0.1	10.3	0.1
Yogurt, fromage frais and dairy desserts[5]	8.2	0.0	5.3	0.0	4.6	0.0
Butter and fat spreads	6.5	0.0	7.9	0.1	11.1	0.1
Biscuits, buns, cakes, pastries, pies and puddings	4.1	0.0	8.7	0.0	11.2	0.1
Commercial toddlers foods and drinks	3.8	0.0	0.5	0.0	0.1	0.0
Eggs, egg products and dishes	2.5	0.0	1.5	0.0	1.2	0.0
Potatoes, potato products and dishes	2.3	0.0	1.3	0.0	1.2	0.0
Pizza, pasta, rice, products and dishes	2.2	0.0	3.7	0.0	4.3	0.0
Bread	1.9	0.0	3.4	0.0	3.5	0.0
Fish, products and dishes	1.3	0.0	1.0	0.0	0.4	0.0
Savoury sauces, pickles gravies and condiments	1.3	0.0	1.1	0.0	0.4	0.0
Sugar, preserves and confectionery	1.1	0.0	1.5	0.0	1.9	0.0
Vegetables, products and dishes	0.9	0.0	1.4	0.0	1.2	0.0
Ice cream[5]	0.8	0.0	1.5	0.0	3.4	0.0
Soup	0.8	0.0	0.8	0.0	0.6	0.0
Breakfast cereals	0.7	0.0	1.6	0.0	1.4	0.0
Number of participants	1275		306		102	

[1] Data sources: DNSYIC (2011) for children aged 12 to 18 months; NDNS years 2016/17 to 2018/19 for children aged 18 to 60 months.

[2] Food groups are ordered by largest to smallest % contribution in the youngest age group.

[4] Food groups that contribute less than 0.5% of intake in all age groups are not presented.

[4] Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.

[5] Includes dairy alternatives.

[6] Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks.

Table A10.7. Energy and macronutrient intakes by IMD quintile: children aged 18 to 60 months in England (NDNS 2008/09 to 2018/19)

Energy and macronutrient		IMD quintile 1 (least deprived)	IMD quintile 2	IMD quintile 3	IMD quintile 4	IMD quintile 5 (most deprived)
Energy MJ/day	Mean (MJ/day)	4.90	4.78	4.91	4.83	4.67
	Lower confidence limit (10%)	4.78	4.66	4.79	4.70	4.54
	Upper confidence limit (90%)	5.03	4.89	5.04	4.95	4.80
Protein g/day	mean (g/day)	43.7	43.7	45.7	43.0	41.9
	Lower confidence limit (5%)	42.3	42.5	44.0	41.8	40.6
	Upper confidence limit (95%)	45.1	44.9	46.8	44.2	43.1
% energy	mean (% energy)	15.1	15.6	15.6	15.2	15.3
	Lower confidence limit (5%)	14.8	15.3	15.3	14.9	15.0
	Upper confidence limit (95%)	15.4	15.9	16.0	15.4	15.6
Carbo-hydrate g/day	mean (g/day)	159	152	157	155	148
	Lower confidence limit (5%)	154	147	153	151	144
	Upper confidence limit (95%)	163	156	162	160	152
% energy	mean (% energy)	51.3	50.1	50.6	50.7	50.3
	Lower confidence limit (5%)	50.6	49.4	49.9	50.1	49.7
	Upper confidence limit (95%)	52.0	50.8	51.2	51.3	50.9
Free sugars g/day	mean (g/day)	39.0	35.5	37.5	37.8	35.7
	Lower confidence limit (5%)	36.5	33.2	35.2	35.6	33.7
	Upper confidence limit (95%)	41.6	37.8	39.9	40.1	37.7
% energy	mean (% energy)	12.4	11.6	11.9	12.1	11.8
	Lower confidence limit (5%)	11.7	10.9	11.2	11.5	11.2
	Upper confidence limit (95%)	13.2	12.2	12.5	12.6	12.3
Dietary fibre g/day	mean (g/day)	11.7	11.2	11.2	11.0	10.3
	Lower confidence limit (5%)	11.3	10.8	10.8	10.6	9.9
	Upper confidence limit (95%)	12.1	11.6	11.6	11.4	10.7

Energy and macronutrient		**IMD quintile 1 (least deprived)**	**IMD quintile 2**	**IMD quintile 3**	**IMD quintile 4**	**IMD quintile 5 (most deprived)**
Total fat g/day	mean (g/day)	43.7	43.3	43.7	43.5	42.7
	Lower confidence limit (5%)	42.2	41.9	42.5	42.2	41.3
	Upper confidence limit (95%)	45.1	44.6	45.0	44.8	44.2
% energy	mean (% energy)	33.6	34.4	33.8	34.2	34.5
	Lower confidence limit (5%)	33.0	33.7	33.3	33.6	33.9
	Upper confidence limit (95%)	34.2	35.0	34.4	34.7	35.0

Energy and macronutrient		**IMD quintile 1 (least deprived)**	**IMD quintile 2**	**IMD quintile 3**	**IMD quintile 4**	**IMD quintile 5 (most deprived)**
Saturated fat g/day	mean (g/day)	18.9	18.6	18.4	18.0	17.6
	Lower confidence limit (5%)	18.2	17.9	17.8	17.3	16.9
	Upper confidence limit (95%)	19.7	19.3	19.0	18.7	18.3
% energy	mean (% energy)	14.6	14.8	14.3	14.1	14.2
	Lower confidence limit (5%)	14.2	14.4	13.9	13.8	13.8
	Upper confidence limit (95%)	15.0	15.2	14.6	14.5	14.5
Cis MUFA g/day	mean (g/day)	14.5	14.5	15.0	15.0	14.9
	Lower confidence limit (5%)	14.0	14.0	14.5	14.5	14.3
	Upper confidence limit (95%)	15.0	15.0	15.5	15.5	15.4
% energy	mean (% energy)	11.1	11.5	11.6	11.8	12.0
	Lower confidence limit (5%)	10.9	11.3	11.4	11.5	11.7
	Upper confidence limit (95%)	11.4	11.8	11.8	12.0	12.2
Cis n-3 PUFA g/day	mean (g/day)	0.94	0.91	0.95	0.95	0.97
	Lower confidence limit (5%)	0.89	0.87	0.90	0.91	0.92
	Upper confidence limit (95%)	0.99	0.96	1.00	1.00	1.02
% energy	mean (% energy)	0.72	0.72	0.73	0.75	0.80
	Lower confidence limit (5%)	0.69	0.69	0.70	0.72	0.76
	Upper confidence limit (95%)	0.75	0.75	0.76	0.78	0.85
Cis n-6 PUFA g/day	mean (g/day)	5.14	5.09	5.22	5.52	5.31
	Lower confidence limit (5%)	4.90	4.87	5.00	5.24	5.09
	Upper confidence limit (95%)	5.38	5.30	5.45	5.79	5.54
% energy	mean (% energy)	3.96	4.05	4.04	4.29	4.31
	Lower confidence limit (5%)	3.80	3.90	3.89	4.14	4.17
	Upper confidence limit (95%)	4.12	4.19	4.20	4.45	4.45
	Number of participants	*210*	*211*	*182*	*234*	*277*

Data source: NDNS years 1 to 11 (2008/09 to 2018/19)

Table A10.8. Sex breakdown of children who gave a blood sample compared with all children

	18 to 47 months		48 to 60 months	
	Children who gave a blood sample %	**All children %**	**Children who gave a blood sample %**	**All children %**
Boys	47.1	51.2	48.2	47.2
Girls	52.9	48.8	51.8	52.8
Number of participants	157	1375	67	453

Data source: NDNS years 2008/09 to 2018/19

Table A10.9. Age breakdown of children who gave a blood sample compared with all children

	18 to 23 months (1 year) %	24 to 35 months (2 years) %	36 to 47 months (3 years) %	48 to 60 months (4 years) %	Number of participants
Children who gave a blood sample	9.4	33.0	26.5	31.1	224
All children	14.8	29.1	28.4	27.7	1828

Data source: NDNS years 2008/09 to 2018/19

Table A10.10. Ethnic minority group breakdown of children who gave a blood sample compared with all children

Ethnic minority group	18 to 47 months		48 to 60 months	
	Children who give a blood sample	**All children**	**Children who give a blood sample**	**All children**
	%	%	%	%
White	75.6	80.5	83.7	81.3
Mixed	3.7	4.0	2.6	5.7
Black or black British	4.4	4.0	2.0	2.9
Asian or Asian British	6.7	8.4	6.0	8.0
Any other group	9.4	3.1	5.7	2.0
Number of participants	453	453	1375	1375

Data source: NDNS years 2008/09 to 2018/19

Table A10.11. Socioeconomic breakdown of households of children who gave a blood sample compared with all children

Occupation of Household Reference Person	18 to 47 months		48 to 60 months	
	Children who gave a blood sample %	All children %	Children who gave a blood sample %	All children %
Higher managerial and professional occupations	21.7	15.3	28.1	23.1
Lower managerial and professional occupations	21.4	25.9	18.0	24.3
Intermediate occupations	10.7	10.0	2.9	7.0
Small employers and own account workers	17.5	10.4	10.6	10.1
Lower supervisory and technical occupations	6.9	9.3	12.8	7.6
Semi-routine occupations	9.8	12.3	18.8	13.1
Routine occupations	3.7	9.6	5.4	9.0
Never worked	7.6	6.0	3.5	4.8
Other or Unclassified	0.6	1.2	28.1	1.0

Data source: NDNS years 2008/09 to 2018/19

Table A10.12. Total dietary energy intake (TDEI): BMR ratio and body weights for children who are above and below the Dietary Reference Values for vitamin A, iron and zinc) (NDNS years 2008/09 to 2018/19)

Age	18 to 47 months					Number of participants	48 to 60 months					Number of participants
	TDEI:BMR[1]	Body weight for age z-scores					TDEI:BMR[1]	Body weight for age z-scores				
		Mean (CI)	median	2.5%ile	97.5%ile			Mean (CI)	median	2.5%ile	97.5%ile	
Vitamin A												
All	1.38	0.64 (0.57-0.70)	0.63	-1.37	2.63	1213	1.44	0.40 (0.30-0.50)	0.37	-1.54	2.83	434
< LRNI	1.03	0.79 (0.31-1.28)	0.33	-1.74	5.32	79						26
≥LRNI	1.41	0.62 (0.56-0.68)	0.64	-1.36	2.57	1134	1.47	0.42 (0.32-0.52)	0.37	-1.57	2.85	408
>≥RNI	1.47	0.68 (0.60-0.76)	0.73	-1.35	2.73	683	1.50	0.41 (0.29-0.54)	0.36	-1.53	2.47	257
Iron												
All	1.38	0.64 (0.57-0.70)	0.63	-1.37	2.63	1213	1.44	0.40 (0.30-0.50)	0.37	-1.54	2.83	434
< LRNI	1.12	0.57 (0.38-0.75)	0.61	-1.75	2.20	105						8
≥LRNI	1.40	0.64 (0.57-0.71)	0.63	-1.34	2.66	1108	1.44	0.40 (0.30-0.50)	0.37	-1.54	2.84	426
≥RNI	1.54	0.71 (0.61-0.81)	0.75	-1.32	2.55	381	1.55	0.48 (0.35-0.60)	0.41	-1.28	2.72	278
Zinc												
All	1.38	0.64 (0.57-0.70)	0.63	-1.37	2.63	1213	1.44	0.40 (0.30-0.50)	0.37	-1.54	2.83	434
< LRNI	0.94	0.43 (0.12-0.74)	0.33	-1.88	2.67	65	1.17	0.19 (0.01-0.36)	0.28	-1.65	1.49	77
≥LRNI	1.41	0.65 (0.58-0.71)	0.63	-1.34	2.58	1148	1.51	0.46 (0.34-0.57)	0.39	-1.52	2.92	357
≥RNI	1.54	0.71 (0.63-0.79)	0.74	-1.33	2.60	592	1.69	0.57 (0.38-0.77)	0.39	-1.47	2.36	98

Abbreviations: BMR, basal metabolic rate, LRNI, Lower Reference Nutrient Intake; RNI, Reference Nutrient Intake

[1] BMR calculated using the Henry equations (SACN, 2011)

Table A10.13. Iron status (plasma ferritin, iron deficiency [ID], anaemia, iron deficiency anaemia [IDA]) in children aged 12 to 60 months in the UK (DNSIYC and NDNS RP years 2008/09 to 2018/19)

	Haemoglobin (g/dl) Mean (SD)		Plasma ferritin(µg/l) Mean (SD)		% ID (plasma ferritin below 12µg/l)		% anaemia (haemoglobin below 110g/l)		% IDA (% below thresholds for ferritin and haemoglobin)	
Age	**All children[4]**	**Children with CRP <5mg/l[5]**	**All children[6]**	**Children with CRP <5mg/l[7]**	**All children %**	**Children with CRP <5mg/l %**	**All children %**	**Children with CRP <5mg/l %**	**All children %**	**Children with CRP <5mg/l %**
12 to 18 months[1]	11.7 (1.0)	No data	28.3 (18.8)	No data	11	No data	15	No data	2	No data
18 to 47 months[2]	12.0 (8.2)	11.9 (8.3)	24.5 (18.7)	22.4 (15.7)	23.9	26.4	9.0	9.8	3.3	3.7
48 to 60 months[2]	12.3 (8.0)	[12.4][3] [8.1]	29.1 (22.6)	[25.2][3] [11.9]	20.0	[20.0][3]	7.2	[9.7]	[0.0][3]	[0.0][3]

[1] Data from DNSIYC 2011 (Lennox et al, 2013).

[2] Data from NDNS years 1 to 11 (2008/09-2018/19).

[3] Data for a variable with a cell size between 30 to 49 are presented in square brackets.

[4] 325 participants in the 12 to 18 months age category, 140 participants in the 18 to 47 months age category, 58 participants in the 48 to 60 months category.

[5] 107 participants in the 18 to 47 months age category, 47 participants in the 48 to 60 months category.

[6] 298 participants in the 12 to 18 month age category, 117 participants in the 18 to 47 months age category, 53 participants in the 48 to 60 months category.

[7] 99 participants in the 18 to 47 months age category, 42 participants in the 48 to 60 months category.

Table A10.14. Sex breakdown of children at or above or below the DRVs for vitamin A, iron and zinc

		18 to 47 months				48 to 60 months			
Nutrient	**Sex**	**At or above RNI**	**At or above LRNI**	**Below LRNI**	**All children**	**At or above RNI**	**At or above LRNI**	**Below LRNI**	**All children**
		%	%	%	%	%	%	%	%
Vitamin A	Boys	55.3	51.6	47.0	51.2	49.0	48.8	-	47.2
	Girls	44.7	48.4	53.0	48.8	51.0	51.2	-	52.8
	Number of participants	775	1280	95	1375	269	425	28	453
Iron	Boys	54.6	52.3	39.5	51.2	54.2	47.4	-	47.2
	Girls	45.4	47.7	60.5	48.8	45.8	52.6	-	52.8
	Number of participants	418	1257	118	1375	289	445	8	453
Zinc	Boys	51.9	51.7	43.7	51.2	59.3	50.9	33.1	47.2
	Girls	48.1	48.3	56.3	48.8	40.7	49.1	66.9	52.8
	Number of participants	658	1300	75	1375	99	371	82	453
All	Boys	58.4	52.2		51.2	61.5	50.4	-	47.2
	Girls	41.6	47.8		48.8	38.5	49.6	-	52.8
	Number of participants	254	1152	16	1375	71	360	3	453

Data source: NDNS years 2008/09 to 2018/19
Dash (-): No results presented for cells sizes below 30

Table A10.15. Age breakdown of children at or above or below the DRVs for vitamin A, iron and zinc

Nutrient	Age	% at or above RNI	% at or above LRNI	% below LRNI	% all children
Vitamin A	18 to 23 months	15.9	15.3	10.1	14.8
	24 to 35 months	28.3	28.3	36.7	29.1
	36 to 47 months	27.5	28.6	26.4	28.4
	48 to 60 months	28.3	27.7	26.9	27.7
	Number of participants	1044	1705	123	1828
Iron	18 to 23 months	10.9	13.5	34.1	14.8
	24 to 35 months	21.5	28.7	33.5	29.1
	36 to 47 months	23.0	28.5	27.2	28.4
	48 to 60 months	44.6	29.2	5.3	27.7
	Number of participants	707	1702	126	1828
Zinc	18 to 23 months	15.7	15.8	6.2	14.8
	24 to 35 months	33.5	30.3	18.1	29.1
	36 to 47 months	35.8	29.6	17.6	28.4
	48 to 60 months	15.0	24.3	58.1	27.7
	Number of participants	757	1671	157	1828
All	18 to 23 months	16.5	14.7	-	14.8
	24 to 35 months	29.5	29.0	-	29.1
	36 to 47 months	29.1	30.1	-	28.4
	48 to 60 months	24.9	26.2	-	27.7
	Number of participants	325	1512	19	1828

Data source: NDNS years 2008/09 to 2018/19
Dash (-): No results presented for cells sizes below 30

Table A10.16. Ethnic minority group breakdown of children meeting and not meeting the DRVs for vitamin A, iron and zinc

Nutrient	Ethnic minority group	18 to 47 months				48 to 60 months			
		% at or above RNI	% at or above LRNI	% below LRNI	% all children	% at or above RNI	% at or above LRNI	% below LRNI	% all children
Vitamin A	White	82.2	81.1	73.9	80.5	84.5	81.7	-	81.3
	Mixed ethnic group	3.2	3.7	7.7	4.0	4.3	4.7	-	5.7
	Black or Black British	3.3	3.5	9.0	4.0	2.2	2.8	-	2.9
	Asian or Asian British	7.4	8.7	5.8	8.4	7.1	8.5	-	8.0
	Any other group	3.9	3.0	3.5	3.1	1.8	2.2	-	2.0
	Number of participants	775	1280	95	1375	269	425	28	453
Iron	White	81.1	81.3	72.6	80.5	81.2	81.6	-	81.3
	Mixed ethnic group	4.4	4.0	3.7	4.0	7.4	5.6	-	5.7
	Black or Black British	4.4	4.0	3.5	4.0	3.1	3.0	-	2.9
	Asian or Asian British	7.8	7.6	17.2	8.4	7.3	7.7	-	8.0
	Any other group	2.3	3.1	2.8	3.1	1.0	2.0	-	2.0
	Number of participants	418	1257	118	1375	289	445	8	453
Zinc	White	80.1	80.1	86.5	80.5	80.2	82.2	78.1	81.3
	Mixed ethnic group	3.9	4.1	2.4	4.0	9.7	5.3	7.2	5.7
	Black or Black British	4.2	3.7	7.9	4.0	2.4	3.2	1.8	2.9
	Asian or Asian British	8.7	8.7	3.3	8.4	7.7	7.4	10.0	8.0
	Any other group	3.2	3.2		3.1		1.8	2.9	2.0
	Number of participants	658	1300	75	1375	99	371	82	453
All_3	White	82.8	81.7		80.5	85.4	82.3	-	81.3
	Mixed ethnic group	2.8	3.7		4.0	8.1	4.8	-	5.7
	Black or Black British	4.5	3.5		4.0	3.4	3.3	-	2.9
	Asian or Asian British	6.7	7.9		8.4	3.1	7.7	-	8.0

	Any other group	3.2	3.3		3.1		1.8	-	2.0
	Number of participants	254	1152	16	1375	71	360	3	453

Data source: NDNS years 2008/09 to 2018/19
Dash (-): No results presented for cells sizes below 30

Table A10.17. Socioeconomic breakdown of children meeting and not meeting the DRVs for vitamin A, iron and zinc

Nutrient	Socioeconomic group (occupation of Household Reference person)	18 to 47 months				48 to 60 months			
		% at or above RNI	% at or above LRNI	% below LRNI	% all children	% at or above RNI	% at or above LRNI	% below LRNI	% all children
Vitamin A	Higher managerial and professional occupations	17.9	16.2	5.6	15.3	25.6	23.2	-	23.1
	Lower managerial and professional occupations	27.4	26.2	22.8	25.9	26.3	25.5	-	24.3
	Intermediate occupations	9.1	10.6	4.2	10.0	8.2	6.9	-	7.0
	Small employers and own account workers	10.1	10.8	5.8	10.4	10.8	10.8	-	10.1
	Lower supervisory and technical occupations	9.6	9.2	10.6	9.3	7.3	7.6	-	7.6
	Semi-routine occupations	11.4	11.7	19.4	12.3	11.7	13.7	-	13.1
	Routine occupations	9.1	9.3	12.4	9.6	7.7	8.2		9.0
	Never worked	4.3	4.8	18.3	6.0	1.5	3.0	-	4.8
	Other / Unclassified	1.1	1.3	0.7	1.2	1.0	1.1	-	1.0
	Number of participants	775	1280	95	1375	269	425	28	453
Iron	Higher managerial and professional occupations	20.7	16.1	6.0	15.3	22.9	23.3	-	23.1
	Lower managerial and professional occupations	26.8	25.9	25.7	25.9	26.0	24.6	-	24.3
	Intermediate occupations	9.1	10.0	10.5	10.0	8.3	6.9	-	7.0
	Small employers and own account workers	10.2	10.5	8.8	10.4	10.0	9.9	-	10.1
	Lower supervisory and technical occupations	10.1	8.9	13.8	9.3	8.5	7.7	-	7.6
	Semi-routine occupations	11.2	12.5	10.0	12.3	11.2	13.0	-	13.1
	Routine occupations	8.7	9.6	9.8	9.6	7.8	9.2	-	9.0

Nutrient	Socioeconomic group (occupation of Household Reference person)	18 to 47 months				48 to 60 months			
		% at or above RNI	% at or above LRNI	% below LRNI	% all children	% at or above RNI	% at or above LRNI	% below LRNI	% all children
	Never worked	2.5	5.2	14.0	6.0	4.4	4.4	-	4.8
	Other / Unclassified	0.7	1.2	1.5	1.2	0.9	1.0	-	1.0
	Number of participants	418	1257	118	1375	289	445	8	453
Zinc	Higher managerial and professional occupations	17.6	16.1	2.1	15.3	18.2	24.0	19.5	23.1
	Lower managerial and professional occupations	25.6	25.8	27.5	25.9	27.8	24.8	22.5	24.3
	Intermediate occupations	10.9	9.9	12.3	10.0	10.9	8.0	3.1	7.0
	Small employers and own account workers	9.6	10.7	4.8	10.4	6.0	10.9	7.1	10.1
	Lower supervisory and technical occupations	8.2	9.5	5.9	9.3	13.1	8.5	4.0	7.6
	Semi-routine occupations	14.1	11.6	24.7	12.3	10.2	11.5	19.1	13.1
	Routine occupations	8.0	9.8	6.3	9.6	2.5	7.9	13.2	9.0
	Never worked	4.6	5.4	15.0	6.0	8.3	3.0	11.5	4.8
	Other / Unclassified	1.3	1.2	1.4	1.2	2.9	1.3	0.0	1.0
	Number of participants	658	1300	75	1375	99	371	82	453
All	Higher managerial and professional occupations	22.8	17.4		15.3	22.7	23.4	-	23.1
	Lower managerial and professional occupations	26.3	26.4		25.9	37.4	25.4	-	24.3
	Intermediate occupations	9.1	10.2		10.0	12.4	7.6	-	7.0
	Small employers and own account workers	8.8	10.9		10.4	1.6	11.3	-	10.1
	Lower supervisory and technical occupations	8.0	8.5		9.3	11.0	8.7	-	7.6

Nutrient	Socioeconomic group (occupation of Household Reference person)	18 to 47 months				48 to 60 months			
		% at or above RNI	% at or above LRNI	% below LRNI	% all children	% at or above RNI	% at or above LRNI	% below LRNI	% all children
	Semi-routine occupations	12.9	11.4		12.3	7.6	11.8	-	13.1
	Routine occupations	8.8	9.5		9.6	1.4	7.5	-	9.0
	Never worked	2.3	4.3		6.0	2.8	3.1	-	4.8
	Other / Unclassified	1.1	1.3		1.2	3.2	1.3	-	1.0
	Number of participants	254	1152	16	1375	71	360	3	453

Data source: NDNS years 2008/09 to 2018/19
Dash (-): No results presented for cells sizes below 30

Table A10.18. Contributors to iron and total dietary energy intake in children aged 18 to 47 months, comparing all children, those with intakes at or above the LRNI and those with intakes below the LRNI for iron

18 to 47 months	All children				Children < LRNI				Children ≥ LRNI			
Contribution to iron and energy intake	**Iron**		**Energy**		**Iron**		**Energy**		**Iron**		**Energy**	
Food Group	**%**	**mg/d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**
Breakfast cereals	23.4	1.50	5.8	62	17.4	0.55	3.8	29	23.9	1.59	6.0	65
Bread	13.9	0.82	10.0	109	15.6	0.46	8.3	65	13.7	0.85	10.1	113
Meat, meat products and dishes	11.5	0.67	10.6	115	15.6	0.48	11.8	96	11.1	0.69	10.5	117
Biscuits, buns, cakes, pastries, puddings	8.0	0.47	9.6	107	8.2	0.21	7.2	54	8.0	0.49	9.8	112
Vegetables, products and dishes	7.0	0.44	2.6	29	6.6	0.21	1.8	15	7.0	0.46	2.7	30
Pizza, pasta, rice, products and dishes	6.0	0.36	6.7	73	6.3	0.20	6.1	53	6.0	0.38	6.8	75
Fruit	5.3	0.32	5.8	63	5.5	0.17	4.6	38	5.2	0.33	5.9	66
Potatoes products and dishes	3.6	0.2	4.4	48	5.7	0.17	5.5	44	3.5	0.21	4.3	49
Infant formula[3]	3.1	0.29	1.6	16	0.2	0.01	0.1	1	3.3	0.31	1.8	18
Eggs, products and dishes	2.8	0.16	1.5	16	3.3	0.11	1.5	12	2.7	0.17	1.5	17
Sugar preserves and confectionery	1.9	0.11	3.9	43	2.2	0.07	3.2	27	1.8	0.11	3.9	45
Fish products and dishes	1.8	0.10	2.4	26	2.5	0.08	2.8	23	1.7	0.11	2.4	27
Dietary supplements	1.6	0.18	0.0	0	0.0	0	0.0	0	1.7	0.19	0.0	0
Fruit juice and smoothies	1.5	0.09	1.8	20	1.4	0.04	1.1	10	1.5	0.09	1.9	21
Commercial toddlers foods and drinks	1.2	0.08	0.9	10	1.5	0.04	0.6	5	1.2	0.08	0.9	10
Yogurt, fromage frais and dairy desserts[4]	1.2	0.07	4.1	44	1.6	0.04	4.5	38	1.2	0.07	4.0	45
Crisps and savoury snacks	1.2	0.07	2.7	29	1.5	0.05	2.7	21	1.2	0.07	2.6	30
Soup	1.0	0.06	0.6	6	1.0	0.03	0.6	5	1.0	0.06	0.6	6
Milk and cream[4]	1.0	0.07	14.8	162	0.5	0.02	24.9	223	1.0	0.08	13.9	157
Number of participants	1375	1375	1375	1375	116	116	116	116	1259	1259	1259	1259

Data source: NDNS years 2008/09 to 2018/19.

[1] Food groups that contribute less than 1% of intake are not presented.

[2] Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.

[3] Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks.

[4] Includes dairy alternatives.

Table A10.19. Contributors to iron and total dietary energy intake in children aged 18 to 47 months, comparing all children, those with intakes at or above the RNI and those with intakes below the LRNI for iron

18 to 47 months	**All children**				**Children < LRNI**				**Children ≥ RNI**			
Contribution to iron and energy intake	**Iron**		**Energy**		**Iron**		**Energy**		**Iron**		**Energy**	
Food Group	**%**	**mg/d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**
Breakfast cereals	23.4	1.50	5.8	62	17.4	0.55	3.8	29	26.3	2.26	7.3	87
Bread	13.9	0.82	10.0	109	15.6	0.46	8.3	65	10.6	0.90	9.4	116
Meat, meat products and dishes	11.5	0.67	10.6	115	15.6	0.48	11.8	96	9.1	0.77	9.9	125
Biscuits, buns, cakes, pastries, puddings	8.0	0.47	9.6	107	8.2	0.21	7.2	54	6.7	0.57	9.6	121
Vegetables, products and dishes	7.0	0.44	2.6	29	6.6	0.21	1.8	15	6.6	0.58	2.5	30
Pizza, pasta, rice, products and dishes	6.0	0.36	6.7	73	6.3	0.20	6.1	53	5.2	0.45	7.3	88
Fruit	5.3	0.32	5.8	63	5.5	0.17	4.6	38	4.8	0.42	6.2	76
Potatoes products and dishes	3.6	0.21	4.4	48	5.7	0.17	5.5	44	2.9	0.24	4.1	52
Infant formula[3]	3.1	0.29	1.6	16	0.2	0.01	0.1	1	8.1	0.81	4.7	49
Eggs, products and dishes	2.8	0.16	1.5	16	3.3	0.11	1.5	12	2.1	0.18	1.6	20
Sugar preserves and confectionery	1.9	0.11	3.9	43	2.2	0.07	3.2	27	1.4	0.12	2.2	28
Fish products and dishes	1.8	0.10	2.4	26	2.5	0.08	2.8	23	1.6	0.13	2.5	30
Dietary supplements	1.6	0.18	0.0	0	0.0	0	0.0	0	4.7	0.54	0	0
Fruit juice and smoothies	1.5	0.09	1.8	20	1.4	0.04	1.1	10	1.1	0.09	1.7	21
Commercial toddlers foods and drinks	1.2	0.08	0.9	10	1.5	0.04	0.6	5	1.6	0.15	1.5	17
Yogurt, fromage frais and dairy desserts[4]	1.2	0.07	4.1	44	1.6	0.04	4.5	38	0.8	0.07	3.8	47
Crisps and savoury snacks	1.9	0.11	2.7	29	1.5	0.05	2.7	21	0.7	0.06	2.2	28
Soup	1.0	0.06	0.6	6	1.0	0.03	0.6	5	1.0	0.08	0.7	8
Milk and cream[4]	1.0	0.07	14.8	162	0.5	0.02	24.9	223	1.8	0.16	11.0	139
Number of participants	1375				116				1259			

Data source: NDNS years 2008/09 to 2018/19

1 Food groups that contribute less than 1% of intake are not presented

2 Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.

3 Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks

4 Includes dairy alternatives

Table A10.20. Contributors to zinc and total dietary energy intake in children aged 18 to 47 months, comparing all children, those with intakes at or above the LRNI and those with intakes below the LRNI for zinc

18 to 47 months	All children				Children < LRNI				Children ≥ LRNI			
Contributors to zinc and energy intake	**Zinc**		**Energy**		**Zinc**		**Energy**		**Zinc**		**Energy**	
Food Group	**%**	**mg/ d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**
Milk and cream[3]	21.9	1.1	14.8	162	16.2	0.4	8.1	57	22.2	1.1	15.2	169
Meat, meat products and dishes	19.5	1.0	1.6	115	28.5	0.7	14.5	114	19.5	1.0	10.4	115
Bread	9.6	0.5	10.0	109	5.0	0.1	11.1	78	9.5	0.5	9.9	111
Pizza, pasta, rice, products and dishes	6.0	0.3	6.7	73	7.6	0.2	6.9	53	5.9	0.3	6.7	74
Cheese[3]	5.9	0.3	3.0	33	6.6	0.2	2.8	20	5.9	0.3	3.0	33
Breakfast cereals	5.2	0.3	5.8	62	5.3	0.1	6.2	46	5.2	0.3	5.8	62
Biscuits, buns, cakes, pastries, puddings	4.6	0.2	9.6	107	6.8	0.2	12.5	90	4.5	0.2	9.4	108
Yogurt fromage frais and dairy desserts[3]	4.5	0.2	4.1	44	2.2	0.1	3.0	20	4.5	0.2	4.1	46
Vegetables, vegetable products and dishes	4.4	0.2	2.6	29	3.3	0.1	1.6	12	4.4	0.2	2.7	30
Infant formula[4]	3.0	0.2	1.6	16	0	0	0	0	3.1	0.2	1.7	17
Fruit	2.7	0.1	5.8	63	2.9	0.1	4.9	38	2.7	0.1	5.8	65
Potatoes, potato products and dishes	2.5	0.1	4.4	48	4.5	0.1	6.4	49	2.4	0.1	4.3	48
Eggs, egg products and dishes	2.3	0.1	1.5	16	1.0	0.0	0.6	5	2.3	0.1	1.6	17
Fish, fish products and dishes	1.7	0.1	2.4	26	2.5	0.1	3.3	25	1.7	0.1	2.4	27
Number of participants	1375				75				1300			

Data source: NDNS years 2008/09 to 2018/19

1 Food groups that contribute less than 1% of intake are not presented

2 Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.

3 Includes dairy alternatives

4 Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks

Table A10.21. Contributors to zinc and total dietary energy intake in children aged 18 to 47 months, comparing all children, those with intakes at or above the RNI and those with intakes below the LRNI for zinc

18 to 47 months	**All children**				**Children < LRNI**				**Children ≥ RNI**			
% contribution to zinc and energy intake	**Zinc**		**Energy**		**Zinc**		**Energy**		**Zinc**		**Energy**	
Food Group	**%**	**mg/d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**
Milk and cream[3]	21.9	1.1	14.8	162	16.2	0.4	8.1	57	22.1	1.3	15.9	198
Meat, meat products and dishes	19.5	1.0	1.6	115	28.5	0.7	14.5	114	11.3	0.7	10.4	129
Bread	9.6	0.5	10.0	109	5.0	0.1	11.1	78	9.1	0.5	9.7	121
Pizza, pasta, rice, products and dishes	6.0	0.3	6.7	73	7.6	0.2	6.9	53	5.3	0.3	6.6	81
Cheese[3]	5.9	0.3	3.0	33	6.6	0.2	2.8	20	11.6	0.8	3.3	41
Breakfast cereals	5.2	0.3	5.8	62	5.3	0.1	6.2	46	4.7	0.3	5.4	65
Biscuits, buns, cakes, pastries, puddings	4.6	0.2	9.6	107	6.8	0.2	12.5	90	3.9	0.2	8.8	112
Yogurt fromage frais and dairy desserts[3]	4.5	0.2	4.1	44	2.2	0.1	3.0	20	4.4	0.3	4.4	54
Vegetables, vegetable products and dishes	4.4	0.2	2.6	29	3.3	0.1	1.6	12	4.4	0.3	2.9	34
Infant formula[4]	3.0	0.2	1.6	16	0	0	0	0	5.5	0.4	3.0	31
Fruit	2.7	0.1	5.8	63	2.9	0.1	4.9	38	2.5	0.1	5.8	72
Potatoes, potato products and dishes	2.5	0.1	4.4	48	4.5	0.1	6.4	49	1.9	0.1	3.7	48
Eggs, egg products and dishes	2.3	0.1	1.5	16	1.0	0.0	0.6	5	2.4	0.1	1.7	21
Fish, fish products and dishes	1.7	0.1	2.4	26	2.5	0.1	3.3	25	1.5	0.1	2.3	28
Number of participants	1375				75				1300			

Data source: NDNS years 2008/09 to 2018/19

1 Food groups that contribute less than 1% of intake are not presented

2 Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.

3 Includes dairy alternatives

4 Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks

Table A10.22. Contributors to zinc and total dietary energy intake in children aged 48 to 60 months, comparing all children, those with intakes at or above the LRNI and those with intakes below the LRNI for zinc

48 to 60 months	**All children**				**Children < LRNI**				**Children ≥ LRNI**			
% contribution to zinc and energy intake	**Zinc**		**Energy**		**Zinc**		**Energy**		**Zinc**		**Energy**	
Food Group	**%**	**mg/d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**
Meat, meat products and dishes	22.3	1.2	11.5	145	20.6	0.7	10.9	104	22.8	1.4	11.7	156
Milk and cream[3]	17.0	0.9	10.3	132	15.8	0.6	8.6	86	17.4	1.1	10.7	145
Bread	11.0	0.6	11.2	140	12.3	0.4	11.7	116	10.7	0.6	11.0	147
Pizza, pasta, rice, products and dishes	7.3	0.4	7.3	92	8.6	0.3	7.8	78	7.0	0.4	7.2	95
Biscuits, buns, cakes, pastries, puddings	5.6	0.3	11.7	150	6.7	0.2	12.6	133	5.3	0.3	11.4	155
Breakfast cereals	5.2	0.3	5.6	72	4.6	0.2	4.7	48	5.4	0.3	5.9	78
Cheese[3]	5.5	0.3	2.6	34	4.2	0.5	1.7	17	5.9	0.3	2.9	38
Yogurt, fromage frais and dairy desserts[3]	3.8	0.2	3.1	41	3.5	0.1	2.7	26	3.9	0.2	3.3	44
Potatoes, potato products and dishes	3.2	0.2	5.4	69	4.1	0.1	5.9	61	3.0	0.2	5.3	71
Fruit	2.7	0.1	5.6	71	3.7	0.1	6.1	63	2.4	0.1	5.5	73
Eggs, egg products and dishes	2.4	0.1	1.5	19	2.4	0.1	1.3	13	2.5	0.1	1.5	20
Fish, fish products and dishes	1.8	0.1	2.1	27	2.0	0.1	2.5	25	1.8	0.1	2.0	27
Sugar preserves and confectionery	1.7	0.1	5.0	64	2.2	0.1	5.7	62	1.6	0.1	4.8	65
Number of participants	453				82				371			

Data source: NDNS years 2008/09 to 2018/19

1 Food groups that contribute less than 1% of intake are not presented

2 Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.

3 Includes dairy alternatives

4 Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks

Table A10.23. Contributors to zinc and total dietary energy intake in children aged 48 to 60 months, comparing all children, those with intakes at or above the RNI and those with intakes below the LRNI for zinc

48 to 59 months	**All children**				**Children < LRNI**				**Children ≥ RNI**			
% contribution to zinc and energy intake	**Zinc**		**Energy**		**Zinc**		**Energy**		**Zinc**		**Energy**	
Food Group	**%**	**mg/d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**	**%**	**mg/d**	**%**	**kcal/d**
Meat, meat products and dishes	22.3	1.2	11.5	145	20.6	0.7	10.9	104	23.9	1.8	11.8	176
Milk and cream[3]	17.0	0.9	10.3	132	15.8	0.6	8.6	86	19.3	1.5	13.5	210
Bread	11.0	0.6	11.2	140	12.3	0.4	11.7	116	9.8	0.7	10.1	158
Pizza, pasta, rice, products and dishes	7.3	0.4	7.3	92	8.6	0.3	7.8	78	6.1	0.5	6.7	102
Biscuits, buns, cakes, pastries, puddings	5.6	0.3	11.7	150	6.7	0.2	12.6	133	4.5	0.3	10.1	158
Breakfast cereals	5.2	0.3	5.6	72	4.6	0.2	4.7	48	5.4	0.4	6.1	92
Cheese[3]	5.5	0.3	2.6	34	4.2	0.5	1.7	17	5.5	0.4	2.9	45
Yogurt, fromage frais and dairy desserts[3]	3.8	0.2	3.1	41	3.5	0.1	2.7	26	4.0	0.3	3.6	56
Potatoes, potato products and dishes	3.2	0.2	5.4	69	4.1	0.1	5.9	61	2.3	0.2	4.7	72
Fruit	2.7	0.1	5.6	71	3.7	0.1	6.1	63	2.4	0.2	5.4	86
Eggs, egg products and dishes	2.4	0.1	1.5	19	2.4	0.1	1.3	13	2.4	0.2	1.6	25
Fish, fish products and dishes	1.8	0.1	2.1	27	2.0	0.1	2.5	25	1.3	0.1	1.6	26
Sugar preserves and confectionery	1.7	0.1	5.0	64	2.2	0.1	5.7	62	1.6	0.1	4.8	65
Number of participants	453				82				371			

Data source: NDNS years 2008/09 to 2018/19

1 Food groups that contribute less than 1% of intake are not presented

2 Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.

3 Includes dairy alternatives

4 Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks

Table A10.24. Contributors to vitamin A and total dietary energy intake in children aged 18 to 47 months, comparing all children, those with intakes at or above the LRNI and those with intakes below the LRNI for vitamin A

18 to 47 months	All children				Children < LRNI				Children ≥ LRNI			
% contribution to vitamin A and energy intake	**Vitamin A**		**Energy**		**Vitamin A**		**Energy**		**Vitamin A**		**Energy**	
Food Group	**%**	**µg/d**	**%**	**kcal/d**	**%**	**µg/d**	**%**	**kcal/d**	**%**	**µg/d**	**%**	**kcal/d**
Milk and cream[3]	18.2	83	14.8	162	19.5	29	9.4	78	18.1	88	15.3	170
Carrots raw and cooked	13.8	98	0.1	1	4.1	7	0.0	0	15	106	0.1	2
Butter and fat spreads	9.7	43	3.0	34	12.4	20	2.4	20	9.5	45	3.1	35
Meat, products and dishes	7.1	45	10.6	115	7.1	11	18.3	160	7.1	48	9.9	111
Cheese[3]	6.7	30	3.0	33	9.9	16	2.5	18	6.4	31	3.0	34
Dietary supplements	6.6	60	0.0	0	0.0	0	0.0	0	7.2	65	0.0	0
Vegetables, products and dishes (excluding carrots)	5.8	30	2.5	27	4.5	6	1.6	15	5.9	32	2.6	29
Biscuits, buns, cakes, pastries, puddings	4.1	18	9.6	107	5.8	7	10.0	84	4.0	19	9.5	109
Yogurt, fromage frais and dairy desserts[3]	4.3	19	4.1	44	7.8	11	3.5	27	4.0	20	4.1	46
Pizza, pasta, rice, products and dishes	3.8	16	6.7	73	5.1	7	5.6	47	3.7	17	6.8	75
Soft drinks	2.7	10	1.4	16	8.3	10	1.9	16	2.2	10	1.3	16
Eggs, products and dishes	2.7	13	1.5	16	1.9	3	0.7	5	2.8	14	1.6	17
Infant formula[4]	2.5	17	1.6	16	0.0	0	0.0	0	2.8	18	1.8	18
Soup	2.4	16	0.6	6	0.6	1	0.2	2	2.5	18	0.6	6
Fruit	1.5	7	5.8	63	2.3	3	5.2	44	1.4	7	5.8	65
Commercial toddlers foods and drinks	1.2	9	0.9	10	0.3	0	0.3	2	1.3	9	1.0	11
Ice cream[3]	1.1	5	1.1	13	2.4	4	0.7	6	1.0	5	1.2	13
Number of participants	1375				86				1289			

Data source: NDNS years 2008/09 to 2018/19

1 Food groups that contribute less than 1% of intake are not presented

2 Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.

3 Includes dairy alternatives

4 Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks

Table A10.25. Contributors to vitamin A and total dietary energy intake in children aged 18 to 47 months, comparing all children, those with intakes at or above the RNI and those with intakes below the LRNI for vitamin A

18 to 47 months	All children				Children < LRNI				Children ≥ RNI			
% contribution to vitamin A and energy intake	Vitamin A		Energy		Vitamin A		Energy		Vitamin A		Energy	
Food Group	%	µg/d	%	kcal/d	%	µg/d	%	kcal/d	%	µg/d	%	kcal/d
Milk and cream3	18.2	83	14.8	162	19.5	29	9.4	78	15.5	96	15.5	182
Carrots raw and cooked	13.8	98	0.1	1	4.1	7	0.0	0	18.6	150	0.2	2
Butter and fat spreads	9.7	43	3.0	34	12.4	20	2.4	20	7.6	47	3.1	38
Meat, products and dishes	7.1	45	10.6	115	7.1	11	18.3	160	7.9	65	9.6	113
Cheese[3]	6.7	30	3.0	33	9.9	16	2.5	18	5.2	33	3.1	37
Dietary supplements	6.6	60	0.0	0	0.0	0	0.0	0	10.7	99	0	0
Vegetables, products and dishes (excluding carrots)	5.8	30	2.5	27	4.5	6	1.6	15	5.9	40	3.3	37
Biscuits, buns, cakes, pastries, puddings	4.1	18	9.6	107	5.8	7	10.0	84	3.3	21	9.1	111
Yogurt, fromage frais and dairy desserts[3]	4.3	19	4.1	44	7.8	11	3.5	27	3.5	22	4.4	51
Pizza, pasta, rice, products and dishes	3.8	16	6.7	73	5.1	7	5.6	47	2.7	17	6.5	75
Soft drinks	2.7	10	1.4	16	8.3	10	1.9	16	1.7	10	1.3	16
Eggs, products and dishes	2.7	13	1.5	16	1.9	3	0.7	5	2.5	16	1.7	19
Infant formula[4]	2.5	17	1.6	16	0.0	0	0.0	0	3.5	26	2.7	27
Soup	2.4	16	0.6	6	0.6	1	0.2	2	2.9	24	0.8	8.0
Fruit	1.5	7	5.8	63	2.3	3	5.2	44	1.3	8	6.1	71
Commercial toddlers foods and drinks	1.2	9	0.9	10	0.3	0	0.3	2	1.8	14	1.3	15
Ice cream[3]	1.1	5	1.1	13	2.4	4	0.7	6	0.8	5	1.2	14
Number of participants	1375				86				1289			

Data source: NDNS years 2008/09 to 2018/19

1 Food groups that contribute less than 1% of intake are not presented

2 Average % contribution for each food group has been calculated from the % contribution for each individual. Non consumers are included in the average.

3 Includes dairy alternatives

4 Infant formula consumed by children aged 18 months upwards are mainly follow on formula and growing up milks

Table A10.26. Micronutrient intakes for children aged 12 to 60 months (NDNS 2016/17 to 2018/19 and DNSIYC)

Micronutrient (Dietary Reference Value[1])		**Age groups**					
		12 to 18 months[2]		**18 to 47 months[3]**		**48 to 60 months[3]**	
		From diet and supplements	**From diet only**	**From diet and supplements**	**From diet only**	**From diet and supplements**	**From diet only**
Vitamin A (retinol equivalents) µg/day	mean (µgRE/day)	698	676	543	460	611	530
	median (µgRE/day)	609	599	466	419	450	397
	SD (µgRE/day)	375	351.	323	240	437	387
	2.5th percentile (µgRE/day)	203	203	131	92	184	137
	97.5th percentile (µgRE/day)	1666	1531	1417	1057	1621	1540
	Mean as % RNI	*175*	*169*	*136*	*115*	*153*	*132*
	% below LRNI	*2*	*2*	*8*	*9*	*7*	*10*
Retinol (µg/day)	mean (µg/day)	341	319	319	236	306	225
	median (µg/day)	312	299	244	214	237	182
	SD (µg/day)	183	147	221	121	223	134
	2.5th percentile (µg/day)	113	106	35	35	57	36
	97.5th percentile (µg/day)	752	637	903	502	770	614
	% above TUL	1.9	0.9	4.2	0.4	1.7	0.0
Total carotene (µg/day)	mean (µg/day)	2144	2141	1347	1345	1827	1827
	median (µg/day)	1701	1701	956	956	1128	1127
	SD (µg/day)	1871	1870	1214	1215	2047	2047
	2.5th percentile (µg/day)	145	145	142	142	144	144
	97.5th percentile (µg/day)	7077	7077	4960	4960	8341	8341

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[1] All DRVs are derived from (DH, 1991), except for thiamine and niacin equivalents which are linked to energy requirements. Thiamine and niacin DRVs have been re-calculated based on the revised SACN energy report (SACN, 2011).

[2] Data from DNSIYC 2011 (DH, 2013)

[3] Data from NDNS 2016/17 to 2018/19. Data for some micronutrients is based on 2014/15 to 2016/17 (see footnote 4)

Micronutrient (Dietary Reference Value[1])		**Age groups**					
		12 to 18 months[2]		**18 to 47 months[3]**		**48 to 60 months[3]**	
		From diet and supplements	**From diet only**	**From diet and supplements**	**From diet only**	**From diet and supplements**	**From diet only**
Thiamin (B1)[4]	mean (mg/day)	0.85	0.82	1.01	0.96	1.13	1.09
	median (mg /day)	0.82	0.81	0.95	0.91	1.09	1.08
(RNI: 0.4mg/day age 1-3 years	SD (mg /day)	0.26	0.22	0.36	0.31	0.39	0.30
0.6mg/day age 4-6 years	2.5th percentile (mg /day)	0.44	0.44	0.46	0.45	0.40	0.40
LRNI: 0.2mg/day age 1-3 years	97.5th percentile (mg/day)	1.41	1.30	1.93	1.75	1.85	1.69
0.3mg/day age 4-6 years)	*mean as % RNI*	*223*	165	*202*	*193*	*162*	*155*
	% below LRNI	*0*	0	*0*	*0*	*0*	*0*
Riboflavin (B2)[4]	mean (mg/day)	1.49	1.46	1.34	1.28	1.36	1.31
(RNI: 0.6mg/day age 1-3 years	median (mg /day)	1.46	1.43	1.29	1.23	1.26	1.23
0.8mg/day age 4-6 years	SD (mg /day)	0.53	0.51	0.57	0.52	0.63	0.52
LRNI: 0.3mg/day age 1-3 years	2.5th percentile (mg /day)	0.55	0.53	0.48	0.48	0.46	0.46
0.4mg/day age 4-6 years)	97.5th percentile (mg/day)	2.56	2.47	2.79	2.26	2.81	2.66
	mean as % RNI	*249*	244	*223*	*214*	*171*	*163*
	% below LRNI	*0*	0	*0*	*0*	*1*	*1*
Niacin (B3) equivalent[4]	mean (mg/day)	16.4	16.0	18.4	17.8	21.7	20.8
(RNI: 6mg/day age 1-3 years	median (mg /day)	15.9	15.8	17.2	16.9	20.9	20.6
9mg/day age 4-6 years	SD (mg /day)	4.6	4.4	5.3	4.8	6.4	5.4
LRNI:4mg/day age 1-3 years	2.5th percentile (mg /day)	8.3	8.0	10.0	10.0	8.7	8.7
6mg/day age 4-6 years)	97.5th percentile (mg/day)	26.5	25.6	29.4	28.1	36.6	32.8
	mean as % RNI	*258*	201	*230*	*222*	*197*	*189*
	% below LRNI	*0*	0	*0*	*0*	*0*	*0*

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[4] Data from NDNS 2014/15 to 2016/17

Micronutrient (Dietary Reference Value[1])		**Age groups**					
		12 to 18 months[2]		**18 to 47 months[3]**		**48 to 60 months[3]**	
		From diet and supplements	**From diet only**	**From diet and supplements**	**From diet only**	**From diet and supplements**	**From diet only**
Vitamin B6[4]	mean (mg/day)	1.1	1.1	1.1	1.0	1.3	1.2
	median (mg /day)	1.1	1.1	1.0	1.0	1.2	1.2
(RNI: 0.7mg/day age 1-3 years	SD (mg /day)	0.4	0.4	0.5	0.3	0.6	0.4
0.9mg/day age 4-6 years	2.5th percentile (mg /day)	0.4	0.4	0.5	0.5	0.6	0.6
LRNI: 0.5mg/day age 1-3 years	97.5th percentile (mg/day)	2.0	1.9	2.5	1.7	3.3	1.9
0.7mg/day age 4-6 years)	*mean as % RNI*	202	156	*159*	*146*	*148*	*129*
	% below LRNI	0	0.4	*0*	*0*	*0*	*0*
Vitamin B12[4]	mean (µg/day)	3.7	3.6	3.8	3.7	3.7	3.5
(RNI: 0.5µg/day age 1-3 years	median (µg/day)	3.6	3.6	3.5	3.5	3.3	3.1
0.8µg/day age 4-6 years	SD (µg/day)	1.7	1.7	1.8	1.8	2.1	1.6
LRNI: 0.3µg/day age 1-3 years	2.5th percentile (µg/day)	1.0	1.0	0.9	0.9	1.1	1.1
0.5µg/day age 4-6 years)	97.5th percentile (µg/day)	7.1	7.1	8.2	7.9	9.3	7.5
	mean as % RNI	732	730	*751*	*738*	*462*	*433*
	% below LRNI	0	0	*0*	*0*	*0*	*0*
Folate[4]	mean (µg/day)	144	144	139	135	156	151
(RNI: 70µg/day age 1-3 years	median (µg /day)	143	142	133	130	145	143
100µg/day age 4-6 years	SD (µg /day)	41	40	52	49	55	48
LRNI: 35µg/day age 1-3 years	2.5th percentile (µg /day)	69	69	59	59	73	73
50µg/day age 4-6 years)	97.5th percentile (µg/day)	237	234	256	254	274	255
	mean as % RNI	*218*	*205*	*199*	*194*	*156*	*151*
	% below LRNI	*0*	*0*	*1*	*1*	*1*	*1*
	mean (mg/day)	62.5	60.5	74.5	64.3	81.1	69.0
	median (mg /day)	55.5	54.4	67.3	56.9	71.6	61.8
	SD (mg /day)	34.5	32.8	40.7	34.2	42.8	35.0
	2.5th percentile (mg /day)	17.8	17.8	18.1	18.1	11.3	11.3

		Age groups					
		12 to 18 months[2]		**18 to 47 months[3]**		**48 to 60 months[3]**	
Micronutrient (Dietary Reference Value[1])		**From diet and supplements**	**From diet only**	**From diet and supplements**	**From diet only**	**From diet and supplements**	**From diet only**
Vitamin C[4]	97.5th percentile (mg/day)	149.6	143	170.9	137.2	166.1	160.9
	mean as % RNI	208	202	*248*	*214*	*270*	*230*
(RNI: 30mg/d LRNI: 8mg/d)	*% below LRNI*	*0*	0	*0*	*0*	*0*	*0*
Vitamin D[5]		**Non-breastfed[6]**					
	mean (µg/day)	3.9	3.5	4.0	2.4	3.9	2.5
(Safe intake: 8.5- 10µg/day age <1 year 10µg/day for age 1 up to 4 years	median (µg/day)	1.9	1.7	2.2	1.7	2.4	2.0
	SD (µg/day)	3.9	3.5	4.2	2.5	4.2	2.3
	2.5th percentile (µg/day)	0.3	0.3	0.3	0.2	0.7	0.5
RNI: 10µg/day age ≥4 years)	97.5th percentile (µg/day)	14.0	12.0	15.7	10.1	16.4	8.4
	mean as % RNI	*55*	*50*	*40*	*24*	*39*	*25*
		Breastfed excluding breast milk[7]					
	mean (µg/day)	2.6	1.8	--	--	--	--
	median (µg/day)	1.5	1.2	--	--	--	--
	SD (µg/day)	2.8	1.7	--	--	--	--
	2.5th percentile (µg/day)	0.2	0.2	--	--	--	--

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[5] Prior to publication of the 2016 SACN report there was an RNI for vitamin D of 7µg/day for infants and children aged 0 to 3 years but no RNI was set for children aged 4 years upwards

[6] Vitamin D intake does not include values for breastfed children as the vitamin D content of breast milk is not known. Note breastfeeding status is defined by whether it was recorded in the 4-day diary (Lennox et al, 2013).

[7] Vitamin D intake includes values for breastfed children excluding the contribution from breast milk (therefore excluding any exclusively breastfed children (n=2)) as the vitamin D content of breast milk is not known. Note breastfeeding status is defined by whether it was recorded in the four-day diary (Lennox et al, 2013).

Micronutrient (Dietary Reference Value[1])		**Age groups**					
		12 to 18 months[2]		**18 to 47 months[3]**		**48 to 60 months[3]**	
		From diet and supplements	**From diet only**	**From diet and supplements**	**From diet only**	**From diet and supplements**	**From diet only**
	97.5th percentile (µg/day)	10.8	5.7	--	--	--	--
	mean as % RNI	*37*	*26*	--	--	--	--
Vitamin E[4] (no DRVs)	mean (mg/day)	N/A	4.9	5.9	5.3	7.3	5.8
	median (mg /day)	N/A	4.3	5.2	5.0	5.8	5.6
	SD (mg /day)	N/A	2.2	3.0	2.0	4.5	1.7
	2.5th percentile (mg /day)	N/A	1.8	2.1	2.1	3.2	3.1
	97.5th percentile (mg/day)	N/A	10.4	15.3	10.4	18.7	9.6
Iron (RNI: 6.9mg/day age 1-3 years 6.1mg/day age 4-6 years LRNI: 3.7mg/day age 1-3 years 3.3mg/day age 4-6 years)	mean (mg/day)	6.4	6.4	6.1	5.8	7.2	7.1
	median (mg /day)	6.1	6.0	57	5.6	6.5	6.3
	SD (mg /day)	2.7	2.6	2.4	1.8	2.5	2.5
	2.5th percentile (mg /day)	2.4	2.4	2.8	2.8	3.5	3.5
	97.5th percentile (mg/day)	12.2	12.0	12.0	10.5	13.0	13.0
	mean as % RNI	*93*	*92*	*88*	*84*	*187*	*186*
	% below LRNI	*13*	-	*11*	*11*	*1*	*1*
Calcium[4] (RNI: 350mg/day age 1-3 years 450mg/day age 4-6 years LRNI: 200mg/day age 1-3 years 275mg/day age 4-6 years)	mean (mg/day)	790	789	721	719	701	701
	median (mg /day)	774	771	676	676	646	645
	SD (mg /day)	260	259	272	273	273	272
	2.5th percentile (mg /day)	326	321	291	279	299	299
	97.5th percentile (mg/day)	1330	1318	1335	1335	1339	1339
	mean as % RNI	*226*	*225*	*206*	*206*	*156*	*156*
	% below LRNI	*0*	*0*	*0*	*0*	*0*	*0*
Magnesium[4] (RNI: 85mg/day age 1-3 years 120mg/day age 4-6 years	mean (mg/day)	135	135	148	148	164	164
	median (mg /day)	134	133	143	143	162	162
	SD (mg /day)	37	37	43	42	42	41
	2.5th percentile (mg /day)	68	67	65	65	91	91

Micronutrient (Dietary Reference Value[1])		**Age groups**					
		12 to 18 months[2]		**18 to 47 months[3]**		**48 to 60 months[3]**	
		From diet and supplements	**From diet only**	**From diet and supplements**	**From diet only**	**From diet and supplements**	**From diet only**
LRNI: 50mg/day age 1-3 years 70mg/day age 4-6 years)	97.5th percentile (mg/day)	213	210	249	249	260	254
	mean as % RNI	*159*	*159*	*174*	*174*	*137*	*137*
	% below LRNI	*0*	*0*	*0*	*0*	*0*	*0*
Potassium[4]	mean (mg/day)	1599	1599	1662	1662	1862	1862
	median (mg /day)	1590	1590	1585	1585	1851	1851
(RNI: 800mg/day age 1-3 years 1100mg/day age 4-6 years LRNI: 450mg/day age 1-3 years 600mg/day age 4-6 years)	SD (mg /day)	437	437	497	497	511	511
	2.5th percentile (mg /day)	769	769	716	716	888	888
	97.5th percentile (mg/day)	2507	2503	2720	2720	2871	2871
	mean as % RNI	*200*	200	*208*	*208*	*169*	*169*
	% below LRNI	*0*	0	*0*	*0*	*0*	*0*
Iodine[4]	mean (µg/day)	174	173	125	125	122	119
	median (µg/day)	164	163	112	111	99	95
(RNI: 70µg/day age 1-3 years 100µg/day age 4-6 years LRNI: 40µg/day age 1-3 years 50µg/day age 4-6 years)	SD (µg/day)	80	80	67	67	66	63
	2.5th percentile (µg/day)	55	53	31	31	34	34
	97.5th percentile (µg/day)	337	337	283	283	284	266
	mean as % RNI	*248*	*248*	*179*	*178*	*122*	*119*
	% below LRNI	*0*	*0*	*4*	*4*	*6*	*6*
Selenium[4]	mean (µg/day)	22	22	23	23	26	26
	median (µg/day)	21	21	22	22	25	25

Micronutrient (Dietary Reference Value[1])		**Age groups**					
		12 to 18 months[2]		**18 to 47 months[3]**		**48 to 60 months[3]**	
		From diet and supplements	**From diet only**	**From diet and supplements**	**From diet only**	**From diet and supplements**	**From diet only**
(RNI: 15µg/day for age 1-3 years 20µg/day for age 4-6 years LRNI: 7µg/day for age 1-3 years 10µg/day for age 4-6 years)	SD (µg/day)	7	7	8	8	9	9
	2.5th percentile (µg/day)	11	11	11	11	14	14
	97.5th percentile (µg/day)	38	38	43	43	51	51
	mean as % RNI	*145*	*145*	*155*	*155*	*129*	*129*
	% below LRNI	*1*	*1*	*0*	*0*	*0*	*0*
Zinc[4] (RNI: 5.0mg/day age 1-3 years 6.5mg/day age 4-6 years LRNI: 3.0mg/day age 1-3 years 4.0mg/day age 4-6 years)	mean (mg/day)	5.4	5.4	5.0	4.8	5.4	5.3
	median (mg /day)	5.3	5.3	4.8	4.7	4.9	4.8
	SD (mg /day)	1.6	1.6	1.9	1.4	1.8	1.8
	2.5th percentile (mg /day)	2.7	2.7	2.4	2.4	2.9	2.9
	97.5th percentile (mg/day)	9.1	9.1	8.7	7.9	10.2	9.7
	mean as % RNI	*109*	*108*	*101*	*96*	*84*	*83*
	% below LRNI	*4*	*4*	*8*	*8*	*20*	*21*
Copper[4] (RNI: 0.4mg/day age 1-3 years 0.6mg/day age 4-6 years)	mean (mg/day)	0.50	0.5	0.59	0.58	0.67	0.67
	median (mg /day)	0.49	0.5	0.57	0.57	0.67	0.67
	SD (mg /day)	0.17	0.2	0.20	0.20	0.19	0.19
	2.5th percentile (mg /day)	0.21	0.2	0.24	0.24	0.36	0.36
	97.5th percentile (mg/day)	0.89	0.9	1.05	1.04	1.07	1.06
	mean as % RNI	*126*	*126*	*147*	*146*	*112*	*112*
	Number of participants	1275		306		102	

Table A10.27. Micronutrient status markers for children aged 12 to 60 months (NDNS 2008/09 to 2018/19 and DNSIYC)

Micronutrient status[19] Status marker		**Age groups**		
		12 to 18 months[20]	**18 to 47 months[21]**	**48 to 60 months[21]**
Vitamin A status Plasma retinol (µmol/l) <0.35µmol/l: severe deficiency 0.35-0.70nmol/l: mild deficiency	mean	Not available for this age group	1.03	[1.12]
	median		1.01	[1.16]
	SD		0.26	[0.30]
	2.5th percentile		0.66	[0.61]
	97.5th percentile		1.58	[1.65]
	% below 0.35 µmol/l[22]		*0*	*[0]*
	% 0.35-0.70 µmol/l[9]		*7*	*[10]*
	Number of participants		*103*	*41*
Vitamin C status[23] Plasma vitamin C (µmol/l) <11µmol/l: biochemical depletion[24]	mean	Not available for this age group	72.7	[78.4]
	median		73.4	[77.2]
	SD		24.8	[27.3]
	2.5th percentile		8.4	[39.0]
	97.5th percentile		109.4	[135.0]
	% below 11µmol/l		*2*	*[0]*
	Number of participants		*96*	*39*
Vitamin D status Plasma 25 OH D (nmol/l)	mean	64.3	58.3	[47.7]
	median	62.9	56.1	[49.6]
	SD	24.3	23.2	[21.3]
	2.5th percentile	26.2	9.8	[13.3]

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[19] [ ] data presented in square brackets denotes that the estimates are based on a cell size between 30 and 49. In this case it should be noted that the lower or upper 2.5th percentiles represent data from at most 2 participants.

[20] Data from DNSIYC 2011 (Lennox et al, 2013).

[21] Data from NDNS 2008/09 to 2018/19. Data for some analytes from 2008/09 to 2016/17. See footnote 5.

[22] Concentrations below 0.35 µmol/L are considered to reflect severe deficiency and concentrations between 0.35 µmol/L and 0.70 µmol/L to reflect mild deficiency. It should be noted that the evidence for these thresholds is confined mainly to non-elderly adults (Bates et al, 1997).

[23] Data from NDNS 2008/09 to 2016/17.

[24] Sauberlich HE. Vitamin C status: methods and findings. Annals of the New York Academy of Sciences, 1971; 24: 444–454.

Micronutrient status[19]	Status marker	**Age groups**		
		12 to 18 months[20]	**18 to 47 months**[21]	**48 to 60 months**[21]
< 25nmol/l: increased risk of osteomalacia and rickets[25]	97.5th percentile	122.0	100.0	[83.7]
	% below 25 nmol/l	*2*	*9*	*[21]*
	Number of participants	*300*	*140*	*58*
Iron status				
Plasma ferritin (µg/l)	mean	28.3	24.5	29.1
	median	24.0	19.5	25.5
<12µg/l: depleted iron stores; increased risk of iron deficiency anaemia[26]	SD	18.8	18.7	22.6
	2.5th percentile	7.0	3.7	6.0
	97.5th percentile	79.0	60.8	91.1
	% below 12 µg/l	*11*	*24*	*20*
	Number of participants	*298*	*117*	*53*
Haemoglobin (g/l)	mean	11.7	12.0	12.3
	median	11.7	11.9	12.5
<110g/l: anaemia[27]	SD	1.0	0.8	0.8
	2.5th percentile	9.9	10.5	10.5
	97.5th percentile	13.5	13.6	13.4
	% below 110g/l	*15*	*9*	*7*
	% below thresholds for ferritin and haemoglobin	2	3	0
	Number of participants	*325*	*140*	*58*
Transferrin receptors (µg/ml)	mean	8.6	Not available for this age group	Not available for this age group
	median	6.8		
	SD	5.9		
	2.5th percentile	26.6		

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[25] SACN (2016) Vitamin D and Health
[26] SACN (2011) Iron and Health
[27] SACN (2011) Iron and Health

Micronutrient status[19] Status marker		**Age groups** **12 to 18 months**[20]	**18 to 47 months**[21]	**48 to 60 months**[21]
>11µg/ml: depleted iron stores and increased risk of iron deficiency anaemia	97.5th percentile	4.2		
	% below 11µg/ml	*15*		
	Number of participants	*296*		
Folate status[23]				
Red cell folate nmol/l <305nmol/l: clinical threshold for increased risk of anaemia[28]	Mean	Not available for this age group	743	756
	Median		724	698
	SD		215	298
	2.5th percentile		345	341
	97.5th percentile		1239	1508
	% below 305nmol/l threshold		1	0
Serum folate nmol/l <7nmol/l: threshold for clinical deficiency <13nmol/l: threshold for possible deficiency	Mean	Not available for this age group	34.8	29.1
	Median		28.9	25.2
	SD		18.3	14.1
	2.5th percentile		11.4	9.8
	97.5th percentile		69.7	57.9
	% below threshold 7nmol/l		0	0
	% below threshold 13nmol/l		3	6

'--' no data available

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[28] WHO. Serum and red blood cell folate concentrations for assessing folate in populations. Vitamins and Mineral Nutrition Information System. 2015; 01.1-7

Table A10.28. Vitamin D intakes by ethnic minority group for children aged 12 to 60 months (NDNS 2016/17 to 2018/19 and DNSIYC)

Vitamin D intake	12 to 18 months[a]				18 to 60 months[b]			
	Black and other ethnic minority groups		White		Black and other ethnic minority groups		White	
	From diet only	From diet and supplements	From diet only	From diet and supplements	From diet only	From diet and supplements	From diet only	From diet and supplements
Mean (µg/day)	3.8	4.7	3.3	3.6	2.9	5.1	2.3	3.8
Median (µg /day)	1.9	2.7	1.6	1.8	2.0	3.1	1.8	2.2
SD (µg /day)	4.0	4.5	3.2	3.6	3.4	4.8	2.1	4.0
2.5th percentile (µg /day)	0.2	0.3	0.3	0.3	0.2	0.4	0.4	0.4
97.5th percentile (µg/day)	12.1	15.5	11.1	13.4	11.1	18.7	8.0	14.8
Number of participants	*90*		*1085*		*63*		*343*	

[a] Data from DNSIYC 2011 (DH, 2013).

[b] Data from NDNS 2016/17 to 2018/19.

Table A10.29. Vitamin D status by ethnic group for children aged 12 to 18 months (DNSIYC)

Vitamin D status		**12 to 18 months[1]**	
		Black and other ethnic minority groups	**White**
25 hydroxy vitamin D (nmol/l)	Mean (nmol/l)	[61.0]	66.1
	Median (nmol/l)	[60.3]	65.3
	SD (nmol/l	[25.7]	24.4
	2.5th percentile (nmol/l)	[12.9]	26.3
	97.5th percentile (nmol/l)	[112]	117
	% below 25nmol/l	*[4]*	*1*
	Number of participants	*40*	*191*

[1] Data from DNSIYC 2011 (Lennox et al, 2013).

Note that blood samples were not collected over a full calendar year

Table A10.30. Micronutrient intakes from food sources by IMD quintile: children aged 18 to 60 months England (NDNS 2008/09 to 2018/19)

Micronutrient[1]		**IMD quintile 1 (least deprived)**	**IMD quintile 2**	**IMD quintile 3**	**IMD quintile 4**	**IMD quintile 5 (most deprived)**
Vitamin A (retinol equivalents [RE]) µg/day	mean (µg RE/day)	562	540	520	488	421
	Lower confidence limit (10%)	523	500	481	455	396
	Upper confidence limit (90%)	601	579	560	522	445
Thiamin (B1) mg/day	mean (mg/day)	0.99	0.99	1.04	0.99	0.95
	Lower confidence limit (10%)	0.95	0.95	1.00	0.94	0.91
	Upper confidence limit (90%)	1.04	1.03	1.09	1.04	0.99
Riboflavin (B2) mg/day	mean (mg/day)	1.42	1.43	1.44	1.32	1.30
	Lower confidence limit (10%)	1.34	1.36	1.36	1.24	1.24
	Upper confidence limit (90%)	1.49	1.50	1.52	1.39	1.37
Niacin (B3) equivalent mg/day	mean (mg/day)	18.9	19.5	20.4	18.8	18.8
	Lower confidence limit (10%)	18.2	18.8	19.6	18.0	18.1
	Upper confidence limit (90%)	19.6	20.3	21.3	19.6	19.6

Micronutrient[1]		**IMD quintile 1 (least deprived)**	**IMD quintile 2**	**IMD quintile 3**	**IMD quintile 4**	**IMD quintile 5 (most deprived)**
Vitamin B6 mg/day	mean (mg/day)	1.3	1.3	1.3	1.2	1.2
	Lower confidence limit (10%)	1.2	1.2	1.2	1.1	1.1
	Upper confidence limit (90%)	1.3	1.3	1.4	1.3	1.3
Vitamin B12 µg/day	mean (µg/day)	3.9	4.0	4.1	3.5	3.5
	Lower confidence limit (10%)	3.6	3.8	3.8	3.3	3.3
	Upper confidence limit (90%)	4.2	4.3	4.3	3.7	3.8
Folate µg/day	mean (µg/day)	156	153	153	144	145
	Lower confidence limit (10%)	149	146	146	137	138
	Upper confidence limit (90%)	163	160	160	152	151
Vitamin C mg/day	mean (mg/day)	72.6	67.1	73.9	69.4	66.7
	Lower confidence limit (10%)	67.7	63.0	68.4	65.2	62.6
	Upper confidence limit (90%)	77.6	71.3	79.4	73.7	70.8
Vitamin D µg/day	mean (µg/day)	1.83	2.10	2.16	2.09	2.16
	Lower confidence limit (10%)	1.64	1.92	1.89	1.86	1.91
	Upper confidence limit (90%)	2.02	2.28	2.43	2.31	2.40

Micronutrient[1]		**IMD quintile 1 (least deprived)**	**IMD quintile 2**	**IMD quintile 3**	**IMD quintile 4**	**IMD quintile 5 (most deprived)**
Vitamin E	mean (mg/day)	5.3	5.5	5.5	5.6	5.4
mg/day	Lower confidence limit (10%)	5.0	5.2	5.2	5.2	5.1
	Upper confidence limit (90%)	5.6	5.8	5.9	5.9	5.7
Iron	mean (mg/day)	6.5	6.3	6.5	6.5	6.3
mg/day	Lower confidence limit (10%)	6.2	6.0	6.2	6.3	6.1
	Upper confidence limit (90%)	6.7	6.5	6.7	6.8	6.5
Calcium	mean (mg/day)	769	754	801	718	709
mg/day	Lower confidence limit (10%)	729	718	763	683	675
	Upper confidence limit (90%)	810	791	840	752	743
Magnesium	mean (mg/day)	165	159	164	151	150
mg/day	Lower confidence limit (10%)	159	153	158	145	144
	Upper confidence limit (90%)	171	164	170	157	156
Potassium	mean (mg/day)	1875	1802	1905	1718	1716
mg/day	Lower confidence limit (10%)	1803	1734	1827	1827	1647
	Upper confidence limit (90%)	1947	1870	1983	1983	1784

Micronutrient[1]		**IMD quintile 1 (least deprived)**	**IMD quintile 2**	**IMD quintile 3**	**IMD quintile 4**	**IMD quintile 5 (most deprived)**
Iodine µg/day	mean (µg/day)	131	140	137	133	128
	Lower confidence limit (10%)	122	130	127	122	119
	Upper confidence limit (90)	141	150	147	143	138
Selenium µg/day	mean (µg/day)	25	26	27	24	25
	Lower confidence limit (10%)	23	25	25	23	24
	Upper confidence limit (90%)	26	28	28	26	26
Zinc mg/day	mean (mg/day)	5.2	5.2	5.3	5.0	5.0
	Lower confidence limit (10%)	5.0	5.0	5.1	4.9	4.9
	Upper confidence limit (90%)	5.4	5.3	5.5	5.2	5.2
Copper µg/day	mean (mg/day)	0.63	0.60	0.63	0.59	0.57
	Lower confidence limit (10%)	0.60	0.57	0.60	0.56	0.54
	Upper confidence limit (90%)	0.66	0.63	0.66	0.62	0.60
	Number of participants	210	211	182	234	277

[1] Data from NDNS 2008/09 to 2018/19. Some data from 2008/09 to 2016/17. See footnote 2.

[2] Data from NDNS 2008/09 to 2016/17.

Annex 11: Milk substitution analyses

Table A11.1. Average per gram values of liquid whole, semi skimmed, 1% and skimmed milk

	Per 100 gram values			
	Whole milk[1]	Semi skimmed milk[1]	1% milk[2]	Skimmed milk[1]
Energy (kcal)	63	46	41	34
Energy (kJ)	265	195	173	144
Fat (g)	3.6	1.7	1.0	0.3
Saturated fatty acids (g)	2.29	1.07	0.6	0.13
Calcium (mg)	120	120	123	125
Iodine (µg)	31	30	30	30
Vitamin A retinol equivalents (µg)	38	20	9	1
Riboflavin (mg)	0.23	0.24	0.23	0.22

Values from Composition of Foods Integrated Dataset (2019).

[1] Whole, semi-skimmed and skimmed milk pasteurised average: average of summer and winter values

[2] 1% milk – values calculated as average of skimmed and semi-skimmed

Table A11.2. Mean intakes of energy and nutrients before and after substitution of whole milk with semi skimmed milk in children aged 12 to 18 months – by 5th and 95th percentiles of whole milk consumption

		Energy kcal/d		Energy_kJ/d		Fat g/d		Sat fat g/d		Calcium mg/d		Iodine µg/d		VitA µg/day		Riboflavin mg/day	
		Whole	SS	Whole	SS	Whole	SS	Whole	SS	Whole	SS	Whole	SS	Whole	SS	Whole	SS
No milk	mean	899	899	3786	3786	33.6	33.6	13.4	13.4	667	667	111	111	757	757	1.17	1.17
	median	906	906	3810	3810	32.5	32.5	12.6	12.6	615	615	97	97	680	680	1.08	1.08
	sd	216	216	909	909	10.5	10.5	4.9	4.9	268	268	55	55	403	403	0.49	0.49
	Base	268															
Lowest 5% milk consumption	mean	846	843	3561	3549	32.6	32.2	13.1	12.9	561	561	96	96	681	678	0.93	0.93
	median	828	825	3484	3469	31.6	31.3	12.4	12.1	570	570	91	91	619	615	0.95	0.95
	sd	217	217	913	912	10.0	10.0	4.7	4.7	176	176	34	34	471	471	0.36	0.37
	Base	54															
Middle 90% milk consumption	mean	975	920	4107	3882	38.3	32.3	18.1	14.2	824	824	167	164	709	652	1.54	1.57
	median	964	912	4063	3849	37.7	31.9	17.9	13.8	823	823	169	166	633	574	1.53	1.56
	sd	195	191	822	802	9.7	9.1	5.0	4.2	228	228	54	52	360	363	0.43	0.44
	Base	905															
Top 5% milk consumption	mean	1082	947	4556	4002	47.7	32.7	25.4	15.7	1262	1262	285	278	697	554	2.37	2.45
	median	1012	879	4270	3723	45.8	31.0	24.7	14.9	1218	1218	272	265	587	448	2.33	2.42
	sd	202	188	851	793	9.6	8.0	4.8	3.7	214	214	53	52	313	306	0.38	0.39

	Base	48															
All	mean	958	914	4034	3853	37.5	32.6	17.2	14.0	798	798	157	154	718	672	1.47	1.50
	median	954	906	4018	3814	36.9	32.0	16.9	13.7	781	781	154	151	637	584	1.44	1.46
	sd	206	198	867	832	10.3	9.4	5.6	4.4	264	264	65	63	373	377	0.51	0.53
	Base	1275															

Table A11.3. Mean intakes of energy and nutrients before and after substitution of whole milk with 1% fat milk in children aged 12 to 18 months – by 5th and 95th percentiles of milk consumption.

Milk_flag_5	metric	Energy kcal/d		Energy_kJ/d		Fat g/day		Sat fat g/day		Calcium mg/day		Iodine µg/day		VitA µg/day		Riboflavin mg/day	
		Whole	1%	Whole	1%	Whole	1%	Whole	1%	Whole	1%	Whole	1%	Whole	1%	Whole	1%
No milk	mean	899	899	3786	3786	33.6	33.6	13.4	13.4	667	667	111	111	757	757	1.17	1.17
	median	906	906	3810	3810	32.5	32.5	12.6	12.6	615	615	97	97	680	680	1.08	1.08
	sd	216	216	909	909	10.5	10.5	4.9	4.9	268	268	55	55	403	403	0.49	0.49
	Base	268															
Lowest 5% milk consumption	mean	846	842	3561	3545	32.6	32.1	13.1	12.8	561	562	96	96	681	676	0.93	0.93
	median	828	824	3484	3465	31.6	31.2	12.4	12.0	570	571	91	91	619	613	0.95	0.95
	sd	217	217	913	912	10.0	10.0	4.7	4.7	176	176	34	34	471	471	0.36	0.36
	Base	54															
Middle 90%milk consumption	mean	975	904	4107	3812	38.3	30.0	18.1	12.7	824	834	167	164	709	616	1.54	1.54
	median	964	898	4063	3782	37.7	29.5	17.9	12.3	823	832	169	166	633	543	1.53	1.53

	sd	195	190	822	800	9.7	9.3	5.0	4.2	228	231	54	52	360	367	0.43	0.43
	Base	905															
Top 5% milk consumption	mean	1082	907	4556	3828	47.7	27.1	25.4	12.0	1262	1285	285	278	697	467	2.37	2.37
	median	1012	839	4270	3547	45.8	25.5	24.7	11.3	1218	1244	272	265	587	363	2.33	2.33
	sd	202	184	851	776	9.6	7.6	4.8	3.4	214	218	53	52	313	303	0.38	0.38
	Base	48															
All	mean	958	901	4034	3796	37.5	30.7	17.2	12.8	798	805	157	154	718	643	1.47	1.47
	median	954	893	4018	3768	36.9	30.0	16.9	12.3	781	790	154	151	637	564	1.44	1.44
	sd	206	197	867	828	10.3	9.6	5.6	4.3	264	269	65	63	373	383	0.51	0.51
	Base	1275															

Table A11.4. Mean intakes of energy and nutrients before and after substitution of whole milk with skimmed milk in children aged 12 to 18 months – by 5th and 95th percentiles of milk consumption

		Energy_kcal/d		Energy kJ/d		Fat mg/d		Sat fat g/d		Calcium mg/d		Iodine_µg/d		VitA_µg/d		Riboflavin mg/d	
		Whole	Skimmed	Whole	Skimmed	Whole	Skimmed	Whole	Skimmed	Whole	Skimmed	Whole	Skimmed	Whole	Skimmed	Whole	Skimmed
No milk	mean	899	899	3786	3786	33.6	33.6	13.4	13.4	667	667	111	111	757	757	1.17	1.17
	median	906	906	3810	3810	32.5	32.5	12.6	12.6	615	615	97	97	680	680	1.08	1.08
	sd	216	216	909	909	10.5	10.5	4.9	4.9	268	268	55	55	403	403	0.49	0.49
	Base	268															
Lowest 5% milk consumption	mean	846	841	3561	3540	32.6	32.0	13.1	12.7	561	562	96	96	681	674	0.93	0.93
	median	828	823	3484	3459	31.6	31.1	12.4	11.9	570	572	91	91	619	612	0.95	0.95
	sd	217	217	913	912	10.0	10.0	4.7	4.7	176	176	34	34	471	470	0.36	0.36
	Base	54															
Middle 90% milk consumption	mean	975	882	4107	3719	38.3	27.8	18.1	11.2	824	840	167	164	709	591	1.54	1.51
	median	964	877	4063	3698	37.7	27.0	17.9	10.7	823	838	169	166	633	518	1.53	1.49
	sd	195	190	822	800	9.7	9.6	5.0	4.3	228	233	54	52	360	370	0.43	0.42
	Base	905															
Top 5% milk	mean	1082	852	4556	3598	47.7	21.6	25.4	8.3	1262	1301	285	278	697	404	2.37	2.30

consumption	median	1012	783	4270	3314	45.8	20.6	24.7	7.7	1218	1261	272	265	587	316	2.33	2.25
	sd	202	179	851	755	9.6	7.2	4.8	3.2	214	220	53	52	313	301	0.38	0.37
	Base	48															
All	mean	958	883	4034	3721	37.5	28.9	17.2	11.6	798	811	157	154	718	622	1.47	1.45
	median	954	874	4018	3690	36.9	28.3	16.9	11.0	781	795	154	151	637	547	1.44	1.42
	sd	206	197	867	828	10.3	10.1	5.6	4.6	264	272	65	63	373	387	0.51	0.49
	Base	1275															

Table A11.5. Mean intakes of energy and nutrients before and after substitution of whole milk with semi-skimmed milk in children aged 12 to 18 months by 5th and 95th percentiles of energy intake

		Energy kcal/d		Energy kJ/d		Fat_g/d		Satfat_g/d		Calcium_mg/d		Iodine_µg/d		VitA_µg/d		Riboflavin_mg/d	
		Whole	Semi-skimmed	Whole	Semi-skimmed	Whole	Semi-skimmed	Whole	Semi-skimmed	Whole	Semi-skimmed	Whole	Semi-skimmed	Whole	Semi-skimmed	Whole	Semi-skimmed
No milk	mean	899	899	3786	3786	33.6	33.6	13.4	13.4	667	667	111	111	757	757	1.17	1.17
	median	906	906	3810	3810	32.5	32.5	12.6	12.6	615	615	97	97	680	680	1.08	1.08
	sd	216	216	909	909	10.5	10.5	4.9	4.9	268	268	55	55	403	403	0.49	0.49
	Base	268															
Lowest 5%	mean	560	526	2360	2219	21.1	17.3	10.0	7.5	490	490	100	98	491	455	0.99	1.01

energy intake	median	595	546	2512	2306	22.1	16.6	10.1	7.2	473	473	89	88	399	389	0.95	0.98
	sd	116	111	488	467	5.9	5.2	3.4	2.3	191	191	48	46	302	300	0.45	0.47
	Base	50															
Middle 90% energy intake	mean	971	915	4092	3861	38.4	32.1	18.2	14.1	833	833	169	166	708	649	1.55	1.59
	median	963	906	4061	3814	38.1	31.9	17.9	13.8	824	824	169	166	629	568	1.53	1.56
	sd	150	145	633	612	8.2	7.6	4.7	3.6	226	226	57	55	360	365	0.44	0.46
	Base	905															
Top 5% energy intake	mean	1417	1343	5967	5663	57.8	49.6	26.9	21.6	1170	1170	233	229	902	824	2.10	2.14
	median	1380	1316	5797	5539	55.4	48.7	26.6	21.4	1125	1125	227	225	875	784	1.92	1.97
	sd	119	115	502	486	8.0	7.3	5.3	3.5	289	289	77	75	375	383	0.60	0.62
	Base	52															
All	mean	958	914	4034	3853	37.5	32.6	17.2	14.0	798	798	157	154	718	672	1.47	1.50
	median	954	906	4018	3814	36.9	32.0	16.9	13.7	781	781	154	151	637	584	1.44	1.46
	sd	206	198	867	832	10.3	9.4	5.6	4.4	264	264	65	63	373	377	0.51	0.53
	Base	1275															

Table A11.6. Mean intakes of energy and nutrients before and after substitution of whole milk with 1% fat milk in children aged 12 to 18 months by 5th and 95th percentiles of energy intake

		Energy kcal/d		Energy kj/d		Fat g/day		Sat fat g/day		Calcium mg/d		Iodine µg/day		VitA_µg/day		Riboflavin mg/day	
		Whole	1%	Whole	1%	Whole	1%	Whole	1%	Whole	1%	Whole	1%	Whole	1%	Whole	1%
No milk	mean	899	899	3786	3786	33.6	33.6	13.4	13.4	667	667	111	111	757	757	1.17	1.17
	median	906	906	3810	3810	32.5	32.5	12.6	12.6	615	615	97	97	680	680	1.08	1.08
	sd	216	216	909	909	10.5	10.5	4.9	4.9	268	268	55	55	403	403	0.49	0.49
	Base	268															
Lowest 5%	mean	560	515	2360	2175	21.1	15.9	10.0	6.6	490	496	100	98	491	433	0.99	0.99
	median	595	531	2512	2240	22.1	14.7	10.1	6.3	473	478	89	88	399	387	0.95	0.95
	sd	116	111	488	468	5.9	5.5	3.4	2.3	191	195	48	46	302	301	0.45	0.45
	Base	50															
Middle 90%	mean	971	899	4092	3788	18.2	12.6	833	843	833	843	169	166	708	612	1.55	1.55
	median	963	891	4061	3763	17.9	12.2	824	832	824	832	169	166	629	540	1.53	1.53
	sd	150	146	633	613	4.7	3.7	226	231	226	231	57	55	360	369	0.44	0.44
	Base	905															
Top 5%	mean	1417	1322	5967	5568	57.8	46.5	26.9	19.6	1170	1183	233	229	902	776	2.10	2.10
	median	1380	1297	5797	5451	55.4	44.8	26.6	19.6	1125	1141	227	225	875	707	1.92	1.92

	sd	119	118	502	498	8.0	8.0	5.3	3.6	289	295	77	75	375	391	0.60	0.60
	Base	52															
All	mean	958	901	4034	3796	37.5	30.7	17.2	12.8	798	805	157	154	718	643	1.47	1.47
	median	954	893	4018	3768	36.9	30.0	16.9	12.3	781	790	154	151	637	564	1.44	1.44
	sd	206	197	867	828	10.3	9.6	5.6	4.3	264	269	65	63	373	383	0.51	0.51
	Base	1275															

Table A11.7. Mean intakes of energy and nutrients before and after substitution of whole milk with skimmed milk in children aged 12 to 18 months by 5th and 95th percentiles of energy intake

		Energy_kcal/d		Energy_kJ/d		Fat g/d		Satfat g/d		Calcium g/d		Iodine µg/d		Vit A µg/d		Riboflavin mg/d	
		Whole	Skimmed	Whole	Skimmed	Whole	Skimmed	Whole	Skimmed	Whole	Skimmed	Whole	Skimmed	Whole	Skimmed	Whole	Skimmed
No milk	mean	899	899	3786	3786	33.6	33.6	13.4	13.	667	667	111	111	757	757	1.17	1.17
	median	906	906	3810	3810	32.5	32.5	12.6	12.6	615	615	97	97	680	680	1.08	1.08
	sd	216	216	909	909	10.5	10.5	4.9	4.9	268	268	55	55	403	403	0.49	0.49
	Base	268															
Lowest 5% energy	mean	560	501	2360	2116	21.1	14.5	10.0	5.6	490	500	100	98	491	417	0.99	0.97
	median	595	503	2512	2122	22.1	13.3	10.1	5.1	473	481	89	88	399	350	0.95	0.94
	sd	116	112	488	473	5.9	6.0	3.4	2.7	191	198	48	46	302	302	0.45	0.43

intake	Base	50															
Middle 90% energy intake	mean	971	875	4092	3692	38.4	27.5	18.2	11.0	833	850	169	166	708	586	1.55	1.52
	median	963	867	4061	3662	38.1	26.8	17.9	10.5	824	838	169	166	629	510	1.53	1.50
	sd	150	147	633	619	8.2	8.5	4.7	4.0	226	234	57	55	360	373	0.44	0.43
	Base	905															
Top 5% energy intake	mean	1417	1291	5967	5442	57.8	43.5	26.9	17.5	1170	1192	233	229	902	742	2.10	2.05
	median	1380	1268	5797	5333	55.4	42.0	26.6	17.4	1125	1151	227	225	875	655	1.92	1.87
	sd	119	125	502	525	8.0	9.1	5.3	4.2	289	299	77	75	375	398	0.60	0.58
	Base	52															
All	mean	958	883	4034	3721	37.5	28.9	17.2	11.6	798	811	157	154	718	622	1.47	1.45
	median	954	874	4018	3690	36.9	28.3	16.9	11.0	781	795	154	151	637	547	1.44	1.42
	sd	206	197	867	828	10.3	10.1	5.6	4.6	264	272	65	63	373	387	0.51	0.49
	Base	1275															

Table A11.8 Mean age (months) for 5th and 95th percentile whole milk consumption groups

	mean	CI_lower	CI_upper	median	percentile_2.5	percentile_97.5	min	max	sd	Base
No milk	14.09	13.89	14.29	13.50	12.00	16.72	12.00	17.00	1.67	268
Lowest 5%	14.18	13.74	14.62	13.50	12.00	16.77	12.00	17.00	1.64	54
Middle 90%	14.47	14.36	14.58	14.50	12.00	16.81	12.00	17.00	1.65	905
Top 5%	14.07	13.59	14.55	13.50	12.00	16.69	12.00	17.00	1.70	48
All	14.36	14.27	14.45	13.50	12.00	16.79	12.00	17.00	1.66	1275

Table A11.9 Mean age (months) for 5th and 95th percentile energy intake groups

	mean	CI_lower	CI_upper	median	percentile_2.5	percentile_97.5	min	max	sd	Base
No milk	14.09	13.89	14.29	13.50	12.00	16.72	12.00	17.00	1.67	268
Lowest 5%	14.12	13.72	14.53	13.50	12.00	15.93	12.00	17.00	1.47	50
Middle 90%	14.43	14.32	14.54	13.50	12.00	16.81	12.00	17.00	1.67	905
Top 5%	14.82	14.43	15.21	14.50	12.00	16.81	12.00	17.00	1.44	52
All	14.36	14.27	14.45	13.50	12.00	16.79	12.00	17.00	1.66	1275

Table A11.10 The number of children in both the low or high 5th percentile milk consumption group and in the high or low 5th percentile energy intake group

		Whole milk consumption group (5.0 percentiles groups)			Total
		Lowest 5% consumers	Middle 90% consumers	Highest 5% consumers	
Energy intake group (kcal 5 percentile groups)	Lowest 5% kcals	8	42	0	50
	Middle 90% kcals	45	821	39	905
	Highest 5% kcals	1	42	9	52
Total		54	905	48	1007

Based on weighted data. Totals may not add up due to rounding.
Cases in both lowest 5% whole milk consumption group AND lowest 5% kcal energy group n = 8 cases.

Cases in both highest 5% whole milk consumption group AND highest 5% kcal energy group n = 9 cases.

Table A11.11. The % of participants below the LRNI for vitamin A in each group (before and after substitution) – in the low or high 5th percentile whole milk consumption groups.

			Below Vitamin A LRNI (before substitution)	Below Vitamin A LRNI (after substitution semi skimmed)	Below Vitamin A LRNI (after substitution 1%)	Below Vitamin A LRNI (after substitution skimmed)
Whole milk consumption group (5 percentiles)	No whole milk	%	4.6	4.6	4.6	4.6
	Lowest 5% consumers	%	9.3	9.3	9.3	9.3
	Middle 95% consumers	%	1.0	2.3	5.3	9.0
	Highest 5% consumers	%	0.0	0.0	11.2	25.2
Total		%	2.0	3.0	.6	8.7

Based on weighted data. Totals may not add up due to rounding.

Table A11.12. The % of participants below the LRNI for vitamin A in each group (before and after substitution) – 5th percentile energy intake groups

			Below Vitamin A LRNI (before substitution)	Below Vitamin A LRNI (after substitution semi skimmed)	Below Vitamin A LRNI (after substitution 1%)	Below Vitamin A LRNI (after substitution skimmed)
Energy intake group (kcal 5 percentile groups)	No whole milk	%	4.6	4.6	4.6	4.6
	Lowest 5% kcals	%	13.0	21.0	27.2	27.7
	Middle 90% kcals	%	0.8	1.7	5.0	9.0
	Highest 5% kcals	%	0.0	0.0	0.0	7.3
Total		%	2.0	3.0	5.6	8.7

Based on weighted data. Totals may not add up due to rounding.

Table A11.13. Proportion of Survey Participants Meeting the Estimated Average Requirement for Energy

Original DNSIYC dataset	Per cent
Less than EAR energy	13.6
More than EAR energy	86.4
Total	100.0
After substituting whole milk with semi skimmed milk	per cent
Less than EAR energy	17.7
More than EAR energy	82.3
Total	100.0
After substituting whole milk with 1% milk	Per cent
Less than EAR energy	19.5
More than EAR energy	80.5
Total	100
After substituting whole milk with skimmed milk	Per cent
Less than EAR energy	23.5
More than EAR energy	76.5
Total	100

Values calculated using UK weighted DNSIYC dataset

Annex 12: National Child Measurement Programme

Table A12.1 Weight status[a] prevalence of children aged 4 to 5 in England for NCMP collection years 2019/20 and 2020/21

	Sex	2019/20 [b] prevalence[e]	2020/21 [c] prevalence[e]	Change[d]
Underweight	Both	0.9 (0.9 to 1.0)	0.9 (0.9 to 1.0)	0.0
	Boys	1.2 (1.2 to 1.3)	1.2 (1.2 to 1.3)	0.0
	Girls	0.6 (0.6 to 0.7)	0.6 (0.5 to 0.7)	0.0
Healthy Weight	Both	76.1 (76.0 to 76.2)	71.3 (71.1 to 71.6)	-4.8
	Boys	75.5 (75.3 to 75.7)	70.5 (70.1 to 70.8)	-5.0
	Girls	76.7 (76.5 to 76.9)	72.3 (71.9 to 72.6)	-4.4
Overweight	Both	13.1 (13.0 to 13.2)	13.3 (13.1 to 13.5)	0.2
	Boys	13.2 (13.0 to 13.3)	13.5 (13.2 to 13.7)	0.3
	Girls	13.0 (12.9 to 13.2)	13.1 (12.8 to 13.4)	0.1
Obese (including severely obese)	Both	9.9 (9.8 to 10.0)	14.4 (14.2 to 14.6)	4.5
	Boys	10.1 (9.9 to 10.2)	14.8 (14.5 to 15.1)	4.7
	Girls	9.7 (9.5 to 9.8)	14.1 (13.8 to 14.3)	4.4
Severely obese	Both	2.5 (2.5 to 2.6)	4.7 (4.6 to 4.8)	2.2
	Boys	2.7 (2.6 to 2.8)	5.2 (5.0 to 5.3)	2.5
	Girls	2.3 (2.3 to 2.4)	4.3 (4.1 to 4.4)	2.0
Overweight and obese combined	Both	23.0 (22.8 to 23.1)	27.7 (27.5 to 28.0)	4.7
	Boys	23.3 (23.1 to 23.4)	28.3 (27.9 to 28.6)	5.0
	Girls	22.7 (22.5 to 22.8)	27.1 (26.8 to 27.5)	4.4

[a] NCMP definitions of status: BMI centile ≤2: Underweight, BMI centile >2 and <85: Healthy weight, BMI centile ≥85 and <95: Overweight, BMI centile ≥95: Obese, BMI centile ≥99.6: Severely obese.
[b] Data from National Child Measurement Programme, England 2019/20 School Year (NHS Digital, 2020).
[c] Data from National Child Measurement Programme, England 2020/21 School Year (NHS Digital, 2021).
[d] % point difference of (prevalence in 2020/21) minus (prevalence in 2019/20).
[e] prevalence in % (95%CI).

Table A12.2 Weight status[a] prevalence for children aged 4 to 5 in England by ethnic group (NCMP collection year 2020/21[b])

	Underweight[c]	Healthy Weight[c]	Overweight[c]	Obese (including severely obese)[c]	Severely obese[c]	Overweight and obese combined[c]	Bases[d]
Total	0.9 (0.9 to 1.0)	71.3 (71.1 to 71.6)	13.3 (13.1 to 13.5)	14.4 (14.2 to 14.6)	4.7 (4.6 to 4.8)	27.7 (27.5 to 28.0)	129,586
WHITE	0.5 (0.5 to 0.6)	72.0 (71.8 to 72.3)	13.8 (13.6 to 14.0)	13.6 (13.4 to 13.8)	4.2 (4.0 to 4.3)	27.4 (27.1 to 27.7)	88,063
British	0.5 (0.4 to 0.5)	71.9 (71.6 to 72.2)	14.0 (13.8 to 14.2)	13.6 (13.4 to 13.8)	4.1 (4.0 to 4.3)	27.6 (27.3 to 27.9)	77,950
Irish	0.1 (0.0 to 1.3)	71.8 (66.9 to 76.2)	17.8 (14.1 to 22.1)	10.3 (7.6 to 13.9)	2.5 (1.3 to 4.7)	28.1 (23.7 to 33.0)	356
Any other White background	0.9 (0.8 to 1.1)	73.1 (72.2 to 74.0)	12.1 (11.5 to 12.8)	13.8 (13.1 to 14.5)	4.7 (4.3 to 5.1)	25.9 (25.1 to 26.8)	9,757
MIXED	1.4 (1.1 to 1.7)	71.2 (70.1 to 72.2)	12.3 (11.5 to 13.1)	15.2 (14.4 to 16.1)	5.1 (4.6 to 5.6)	27.5 (26.4 to 28.5)	6,850
White and Black Caribbean	1.2 (0.8 to 1.9)	69.6 (67.3 to 71.9)	13.2 (11.6 to 15.0)	16.0 (14.2 to 17.9)	5.4 (4.4 to 6.7)	29.1 (26.9 to 31.5)	1,526
White and Black African	1.0 (0.5 to 1.8)	68.3 (65.2 to 71.2)	11.9 (10.0 to 14.2)	18.8 (16.4 to 21.5)	7.7 (6.1 to 9.6)	30.8 (27.8 to 33.9)	897
White and Asian	1.8 (1.3 to 2.6)	75.5 (73.3 to 77.5)	10.5 (9.0 to 12.0)	12.2 (10.7 to 13.9)	3.9 (3.1 to 5.0)	22.7 (20.7 to 24.8)	1,593
Any other mixed background	1.3 (0.9 to 1.8)	70.5 (68.8 to 72.1)	12.9 (11.7 to 14.2)	15.3 (14.0 to 16.7)	4.8 (4.0 to 5.6)	28.2 (26.6 to 29.9)	2,834
ASIAN	3.3 (3.0 to 3.6)	70.9 (70.2 to 71.7)	9.5 (9.0 to 10.0)	16.3 (15.7 to 17.0)	6.6 (6.2 to 7.0)	25.8 (25.1 to 26.6)	13,157
Indian	4.5 (3.9 to 5.2)	75.4 (74.0 to 76.7)	8.0 (7.2 to 8.9)	12.1 (11.2 to 13.2)	4.3 (3.7 to 5.0)	20.1 (18.9 to 21.4)	3,857
Pakistani	3.1 (2.7 to 3.6)	68.2 (66.9 to 69.5)	10.6 (9.7 to 11.5)	18.1 (17.1 to 19.2)	7.7 (7.0 to 8.5)	28.7 (27.5 to 30.0)	4,989
Bangladeshi	2.5 (1.9 to 3.2)	68.5 (66.5 to 70.4)	9.7 (8.5 to 11.0)	19.3 (17.7 to 21.0)	7.3 (6.3 to 8.5)	29.0 (27.2 to 31.0)	2,144
Any other Asian background	2.3 (1.7 to 3.0)	71.7 (69.8 to 73.6)	9.2 (8.1 to 10.5)	16.8 (15.3 to 18.4)	7.2 (6.2 to 8.3)	26.0 (24.2 to 27.9)	2,167
BLACK	0.9 (0.7 to 1.1)	61.2 (59.9 to 62.5)	15.5 (14.5 to 16.4)	22.5 (21.4 to 23.6)	8.2 (7.5 to 9.0)	37.9 (36.7 to 39.2)	5,625
Caribbean	0.8 (0.4 to 1.7)	65.2 (62.0 to 68.3)	16.4 (14.1 to 19.1)	17.5 (15.1 to 20.2)	6.8 (5.3 to 8.7)	33.9 (30.9 to 37.2)	858
African	0.8 (0.5 to 1.1)	60.2 (58.7 to 61.8)	15.5 (14.4 to 16.7)	23.5 (22.2 to 24.9)	8.3 (7.5 to 9.2)	39.0 (37.5 to 40.6)	3,859
Any other Black background	1.3 (0.8 to 2.3)	61.6 (58.4 to 64.7)	14.3 (12.2 to 16.7)	22.7 (20.1 to 25.6)	9.2 (7.5 to 11.2)	37.1 (34.0 to 40.2)	908
CHINESE	0.8 (0.3 to 2.0)	80.9 (77.3 to 84.1)	10.0 (7.7 to 12.8)	8.3 (6.2 to 11.0)	3.2 (2.0 to 5.1)	18.3 (15.2 to 21.8)	520
Any other ethnic group	0.9 (0.6 to 1.4)	67.7 (65.9 to 69.5)	14.5 (13.1 to 15.9)	16.9 (15.5 to 18.4)	6.6 (5.7 to 7.6)	31.4 (29.6 to 33.2)	2,557
NOT STATED	1.0 (0.9 to 1.2)	71.8 (71.0 to 72.6)	13.1 (12.6 to 13.7)	14.0 (13.4 to 14.6)	4.6 (4.3 to 5.0)	27.2 (26.4 to 27.9)	12,814

[a] NCMP definitions of status: BMI centile ≤2: Underweight, BMI centile >2 and <85: Healthy weight, BMI centile ≥85 and <95: Overweight, BMI centile ≥95: Obese, BMI centile ≥99.6: Severely obese.

[b] data from National Child Measurement Programme, England 2020/21 School Year (NHS Digital, 2021)
[c] prevalence in % (95%CI).
[d] weighted bases; NCMP figures for collection year 2020/21 are based on weighted data due to a smaller sample of measurements collected than in previous years.

Table A12.3 Weight status[a] prevalence of children aged 4 to 5 in England by Index of Multiple Deprivation (IMD) decile (based on the postcode of the child) (NCMP collection year 2020/21[b])

	Underweight [c]	Healthy Weight [c]	Overweight [c]	Obese (including severely obese) [c]	Severely obese [c]	Overweight and obese combined [c]
1 (most deprived)[d]	1.0 (0.8 to 1.1)	64.5 (63.9 to 65.2)	14.2 (13.8 to 14.7)	20.3 (19.7 to 20.8)	7.6 (7.3 to 8.0)	34.5 (33.8 to 35.2)
2	1.1 (1.0 to 1.3)	67.4 (66.6 to 68.1)	13.8 (13.3 to 14.3)	17.7 (17.1 to 18.3)	6.5 (6.2 to 6.9)	31.5 (30.8 to 32.2)
3	1.0 (0.9 to 1.2)	68.6 (67.8 to 69.4)	13.8 (13.2 to 14.4)	16.6 (16.0 to 17.2)	5.7 (5.4 to 6.1)	30.4 (29.6 to 31.1)
4	1.1 (0.9 to 1.3)	70.5 (69.7 to 71.3)	13.9 (13.4 to 14.5)	14.5 (13.9 to 15.1)	4.6 (4.3 to 5.0)	28.4 (27.7 to 29.2)
5	0.9 (0.7 to 1.1)	71.6 (70.8 to 72.4)	13.5 (12.9 to 14.1)	14.0 (13.4 to 14.7)	4.8 (4.4 to 5.2)	27.5 (26.7 to 28.3)
6	1.0 (0.8 to 1.1)	73.0 (72.1 to 73.8)	12.9 (12.3 to 13.5)	13.2 (12.6 to 13.8)	3.9 (3.6 to 4.3)	26.1 (25.3 to 26.9)
7	0.9 (0.7 to 1.1)	73.9 (73.0 to 74.7)	13.1 (12.5 to 13.7)	12.1 (11.5 to 12.8)	3.4 (3.0 to 3.7)	25.2 (24.4 to 26.1)
8	0.7 (0.6 to 0.9)	76.5 (75.7 to 77.3)	11.8 (11.2 to 12.5)	11.0 (10.4 to 11.6)	3.0 (2.6 to 3.3)	22.8 (22.0 to 23.6)
9	0.6 (0.5 to 0.8)	77.2 (76.3 to 78.0)	12.4 (11.8 to 13.1)	9.8 (9.2 to 10.4)	2.1 (1.9 to 2.4)	22.2 (21.4 to 23.0)
10 (least deprived)	0.7 (0.6 to 0.9)	79.5 (78.7 to 80.3)	11.9 (11.3 to 12.5)	7.8 (7.3 to 8.4)	1.9 (1.6 to 2.2)	19.7 (19.0 to 20.5)
Total	0.9 (0.9 to 1.0)	71.3 (71.1 to 71.6)	13.3 (13.1 to 13.5)	14.4 (14.2 to 14.6)	4.7 (4.6 to 4.8)	27.7 (27.5 to 28.0)

[a] NCMP definitions of status: BMI centile ≤2: Underweight, BMI centile >2 and <85: Healthy weight, BMI centile ≥85 and <95: Overweight, BMI centile ≥95: Obese, BMI centile ≥99.6: Severely obese.

[b] Data from National Child Measurement Programme, England 2020/21 School Year (NHS Digital, 2021). NCMP figures for collection year 2020/21 are based on weighted data due to a smaller sample of measurements collected than in previous years.

[c] prevalence in % (95%CI).

[d] column shows IMD deciles 1 to 10

Table A12.4 Prevalence of obese children (including severely obese) aged 4 to 5 in least and most deprived IMD deciles (based on the postcode of the school) by sex and NCMP collection year

Sex	Both	Both	Boys	Boys	Girls	Girls
IMD decile	1 (most deprived) [a]	10 (least deprived) [a]	1 (most deprived) [a]	10 (least deprived) [a]	1 (most deprived) [a]	10 (least deprived) [a]
2006/07[b]	12.2 (11.9 to 12.5)	7.7 (7.4 to 7.9)	13.0 (12.6 to 13.4)	8.3 (8.0 to 8.7)	11.3 (10.9 to 11.7)	7.0 (6.7 to 7.3)
2007/08	11.8 (11.6 to 12.1)	7.2 (7.0 to 7.4)	12.6 (12.2 to 12.9)	7.9 (7.5 to 8.2)	11.1 (10.7 to 11.5)	6.5 (6.2 to 6.8)
2008/09	12.1 (11.9 to 12.4)	7.1 (6.9 to 7.4)	12.8 (12.4 to 13.2)	7.7 (7.4 to 8.0)	11.4 (11.1 to 11.8)	6.6 (6.3 to 6.9)
2009/10	12.5 (12.2 to 12.7)	7.2 (6.9 to 7.4)	13.3 (12.9 to 13.7)	7.7 (7.4 to 8.0)	11.6 (11.3 to 12.0)	6.6 (6.3 to 6.9)
2010/11	12.1 (11.8 to 12.3)	6.9 (6.7 to 7.1)	12.8 (12.5 to 13.2)	7.4 (7.1 to 7.7)	11.2 (10.9 to 11.6)	6.3 (6.0 to 6.6)
2011/12	12.3 (12.1 to 12.6)	6.8 (6.6 to 7.0)	12.7 (12.4 to 13.1)	7.3 (7.0 to 7.6)	12.0 (11.6 to 12.3)	6.2 (5.9 to 6.5)
2012/13	12.1 (11.8 to 12.3)	6.4 (6.2 to 6.6)	12.4 (12.1 to 12.8)	6.9 (6.6 to 7.2)	11.6 (11.3 to 12.0)	5.8 (5.5 to 6.1)
2013/14	12.0 (11.7 to 12.2)	6.6 (6.4 to 6.8)	12.4 (12.1 to 12.8)	6.9 (6.6 to 7.2)	11.5 (11.2 to 11.9)	6.3 (6.1 to 6.6)
2014/15	11.9 (11.6 to 12.1)	6.3 (6.1 to 6.5)	12.2 (11.9 to 12.6)	6.5 (6.3 to 6.8)	11.5 (11.1 to 11.8)	6.1 (5.8 to 6.3)
2015/16	12.4 (12.2 to 12.7)	6.2 (6.0 to 6.4)	12.8 (12.4 to 13.1)	6.6 (6.3 to 6.9)	12.1 (11.8 to 12.4)	5.8 (5.5 to 6.1)
2016/17	12.5 (12.3 to 12.8)	6.6 (6.4 to 6.8)	13.1 (12.7 to 13.4)	6.8 (6.5 to 7.0)	12.0 (11.6 to 12.3)	6.3 (6.1 to 6.6)
2017/18	12.4 (12.2 to 12.7)	6.4 (6.2 to 6.6)	12.9 (12.6 to 13.3)	6.6 (6.3 to 6.9)	11.9 (11.6 to 12.3)	6.2 (5.9 to 6.4)
2018/19	12.9 (12.7 to 13.2)	6.4 (6.2 to 6.6)	13.2 (12.9 to 13.6)	6.8 (6.5 to 7.1)	12.6 (12.3 to 13.0)	6.0 (5.7 to 6.3)
2019/20	13.0 (12.7 to 13.3)	6.7 (6.5 to 6.9)	13.2 (12.8 to 13.6)	6.7 (6.4 to 7.1)	12.8 (12.4 to 13.3)	6.6 (6.3 to 7.0)
2020/21[c]	19.7 (19.1 to 20.4)	9.1 (8.6 to 9.6)	19.9 (19.1 to 20.8)	9.8 (9.1 to 10.5)	19.6 (18.7 to 20.5)	8.3 (7.7 to 9.0)

[a] prevalence in % (95%CI).

[b] column shows NCMP collection year

[c] NCMP figures for collection year 2020/21 are based on weighted data due to a smaller sample of measurements collected than in previous years

Annex 13: Glossary

Ad libitum diet	A diet in which the amount of food is not restricted.
Artificial sweeteners	Also referred to as non-nutritive sweeteners, low calorie sweeteners or intense sweeteners, describing chemical low- or no-calorie substances that can be used to sweeten foods and drinks in place of sugar (Sharma et al 2016). The term ‘artificial sweeteners’ is also used in the UK government advice (NHS) and therefore was adopted in this report. However, due to the lack of agreed terminology on artificial sweeteners, the terms adopted by the SR authors are used in the evidence section.
Breastfeeding	The feeding of an infant with milk taken from the breasts, either directly by the infant or expressed and given to the infant via a bottle or other drinking vessel.
Breastfeeding intensity	Breastfeeding intensity is defined as the proportion of daily feedings that are breast milk.
Body mass index (BMI)	An individual’s weight in kilograms divided by the square of height in metres (kg/m^2). Often used as an indicator of adiposity with recognised limitations (Pietrobelli et al, 1998).
Bottle feeding	Feeding an infant from a bottle, whatever is in the bottle, including expressed breast milk, water, infant formula, etc.
Bioavailability	Bioavailability is defined as the efficiency with which a dietary component is used systemically through normal metabolic pathways. It is expressed as a % of intakes and is known to be influenced by dietary and host factors.
Cardiovascular disease	Cardiovascular disease is the most common cause of death in the UK and includes coronary heart disease, angina, heart attack and stroke.
Catch-up growth	Rapid growth following a period of restriction. Ultimately, it may redress wholly or partly the accrued deficit in weight or size though there may be consequences for body composition and metabolic capacity. This phenomenon is also often seen in children who are born small-for-gestational-age or with a low birthweight.
Cohort study	Systematic follow-up of a group of people for a defined period of time or until a specified event. Also known as a longitudinal study. A cohort study may collect data prospectively or retrospectively.
Complementary feeding	The WHO defines complementary feeding as “the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants” so that “other foods and liquids are needed, along with breast milk.” (PAHO, 2003). For the purposes of this report, complementary feeding refers to the period when solid foods are given in addition to either breast milk or infant formula to

	complement the nutrients provided by breast milk (and/or infant formula) when breast milk (and/or infant formula) alone is not sufficient to meet the nutritional requirements of the growing infant. Complementary feeding replaces the term 'weaning' which can be misinterpreted to mean the cessation of breastfeeding rather than the introduction of solid foods. Complementary feeding includes all liquids, semi-solid and solid foods, other than breast milk and infant formula.
Crossover study design	A study design in which participants receive multiple interventions, and the effect of the interventions are measured on the same individuals.
Dairy	Dairy refers to milk produced by an animal, specifically a mammal such as goats, sheep, cows or even camels and water buffalo. All mammalian milk is considered dairy but there are differences in butterfat content, lactose, and protein.
Diabetes	A metabolic disorder involving impaired metabolism of glucose due to either failure of secretion of the hormone insulin, insulin-dependent or type 1 diabetes, OR impaired responses of tissues to insulin, non-insulin-dependent or type 2 diabetes.
Diet and Nutrition Survey of Infants and Young Children (DNSIYC)	Survey providing detailed information on the food consumption, nutrient intakes and nutritional status of infants and young children aged 4 up to 18 months living in private households in the UK. Fieldwork was carried out between January and August 2011.
Dietary diversity score	A hypothesis-driven approach of assessing diet quality. This method considers the number of portions from each food group (for example dairy, meat, cereals, fruits and vegetables) or foods consumed on regular basis (Gherasim et al 2020). The underlying principle behind measuring dietary diversity is that to achieve a 'balanced diet', variety in dietary sources is needed. However, there is no standardised method of measuring dietary diversity (Gil et al 2015).
Dietary guideline	The role of dietary guidelines is to assist populations to follow a healthy balanced diet with adequate nutrient intake and focus on prevention of non-communicable diseases.
Diversification of the diet	Diversification of the diet refers to the progression from an exclusively milk-based diet to an eating pattern which includes a wide range of foods.
Doubly labelled water (DLW) method	Doubly labelled water is water in which both the hydrogen (H) and oxygen (^{16}O) have been partly or completely replaced for tracing purposes (that is, labelled) with 'heavy', non-radioactive forms of these elements: ^{2}H and ^{18}O. The DLW method measures the rate of disappearance of these 2 tracers given to an individual in water as they are washed out of the body. ^{18}O disappears faster from the body than ^{2}H because it is lost in both urine and as carbon dioxide in breath. ^{2}H is only lost from the body in urine. The difference between how fast ^{2}H and ^{18}O disappear provides a measurement of carbon

	dioxide production and this can then be converted into the amount of energy used.
Dietary Reference Values (DRVs)	DRVs provide benchmark levels of nutrient requirements which can be used to compare mean values for population intakes. Although information is usually inadequate to calculate precisely and accurately the range of requirements for a nutrient in a group of individuals, it has been assumed to be normally distributed. This gives a notional mean requirement or Estimated Average Requirement (EAR) with the Reference Nutrient Intake (RNI) defined as two notional standard deviations above the EAR. Intakes above the RNI will almost certainly be adequate to meet the needs of 97.5% of the population. The Lower Reference Nutrient Intake (LRNI), which is two notional standard deviations below the EAR, represents the lowest intakes which will meet the needs of approximately 2.5% of individuals in the group. Intakes below this level are almost certainly inadequate for most individuals.
dmfs/DMFS	Decayed, missing, filled surfaces (in primary dentition, lower case; in permanent dentition, upper case)
dmft/DMFT	Decayed, missing, filled teeth (in primary dentition, lower case; in permanent dentition, upper case)
Dyslipidaemia	Dyslipidaemia is an abnormal amount of lipids (triacylglycerols, cholesterol or phospholipids) in the blood.
Dual-energy X-ray absorptiometry (DEXA)	A technique used to measure bone mineral density.
Early childhood caries (ECC)	ECC is defined as one or more decayed, missing or filled tooth surface in any primary tooth of children aged under 71 months. In children younger than 3 years of age, any sign of decay on the smooth surface of the teeth is indicative of severe early childhood caries (S-ECC) (American Academy of Pediatric Dentistry, 2008).
Eating Assessment in Toddlers (EAT) diet score	Based on Dietary Guidelines for Children and Adolescents in Australia; a higher EAT score indicates higher diet quality
Equivalised household income	Equivalisation is a standard methodology that adjusts for household income to account for different demands on resources by considering the household size and composition.
Estimated average requirement (EAR)	Estimated Average Requirement of a group of people for energy or protein or a vitamin or mineral. About half of a defined population will usually need more than the EAR, and half less.
Fat free mass (FFM)	The non fat component of body composition comprising muscle, bone, skin and organs.
Fat mass (FM)	The component of body composition made up of fat.

Formula, Infant formula	A breast milk substitute commercially manufactured to Codex Alimentarius or European Union standards. Infant formula (based on either cows' milk or goats' milk) is the only suitable alternative to breast milk for babies who are under 12 months old. Follow-on formula is not suitable for babies under 6 months old and does not need to be introduced after 6 months. Beyond 1 year, infant and follow-on formula are not needed.
Free sugars	All added sugars in any form; all sugars naturally present in fruit and vegetable juices, purées and pastes and similar products in which the structure has been broken down; all sugars in drinks (except for dairy-based drinks); and lactose and galactose added as ingredients (Swan et al, 2018).
Full-Scale Intelligence Quotient (FSIQ)	A broad measure of intelligence achieved through administration of a standardized intelligence test.
GRADE system	The Grading of Recommendations Assessment, Development and Evaluation (GRADE) system is an approach to grading evidence and recommendations (Guyatt et al, 2011). The assessment of the evidence using the GRADE system involves consideration of within-study risk of bias (methodological quality), directness of evidence, heterogeneity, precision of effect estimates and risk of publication bias (www.gradeworkinggroup.org). The interpretation of GRADE evidence assessments is that where the quality of the evidence is rated as HIGH, there is considerable confidence that the true effect lies close to that of the estimate of the effect; when rated as MODERATE, there is moderate confidence in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different; when rated as LOW, confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect. Where the quality of evidence is rated as VERY LOW, there is very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect (COT, 2016b).
Healthy Start	UK-wide government scheme to offer a nutritional safety net for pregnant women, new mothers and children under 4 years of age in very low income families, and encourage them to eat a healthier diet. The scheme provides vouchers to put towards the cost of milk, fruit and vegetables or infant formula, and coupons for free Healthy Start vitamin supplements.
High income country (HIC)	The World Bank defines economies into four income groupings: low, lower-middle, upper-middle, and high. Income is measured using gross national income (GNI) per capita, in US dollars, converted from local currency using the World Bank Atlas method. Estimates of GNI are obtained from economists in World Bank country units; and the size of the population is estimated by World Bank demographers from a variety of sources, including the United Nation's biennial World Population Prospects. Currently a HIC is defined as having a GNI per capita of $12,236 or more

	(https://datahelpdesk.worldbank.org/knowledgebase/articles/378834-how-does-the-world-bank-classify-countries).
Home Observation Measurement of the Environment (HOME) score	The primary measure of the quality of a child's home environment. It has been used as both an input in helping to explain other child characteristics or behaviours and as an outcome for researchers whose objective is to explain associations between the quality of a child's home environment and earlier familial and maternal traits and behaviours.
Incidence of breastfeeding	Proportion of babies who were breastfed initially. This includes all babies who were put to the breast at all, even if this was on one occasion only. It also includes giving expressed breast milk to the baby.
Index of Multiple Deprivation (IMD)	The Index of Multiple Deprivation (IMD) is the official measure of relative deprivation in England and is part of a suite of outputs that form the Indices of Deprivation (IoD). It follows an established methodological framework in broadly defining deprivation to encompass a wide range of an individual's living conditions. People may be considered to be living in poverty if they lack the financial resources to meet their needs, whereas people can be regarded as deprived if they lack any kind of resources, not just income.
Infant	A child not more than 12 months (1 year) of age.
Infant Feeding Survey (IFS)	National survey of infant feeding practices conducted every 5 years from 1975 to 2010. The survey provided national estimates of the incidence, prevalence, and duration of breastfeeding (including exclusive breastfeeding) and other feeding practices adopted by mothers in the first 8 to 10 months after their infant was born. In the more recent surveys these estimates were provided separately for England, Wales, Scotland and Northern Ireland, as well as for the UK as a whole.
Intervention study	Comparison of an outcome (for example, disease) between two or more groups deliberately subjected to different exposures (for example, dietary modification or nutrient supplementation).
Key Stage 2 (KS2)	Formal assessments tests in English (grammar, punctuation, spelling and reading) and maths that children in the UK take in year 6 (at age 11 years).
Linear growth	An increase in the length or height of an infant or child.
Low and middle income country (LMIC)	The World Bank defines economies into four income groupings: low, lower-middle, upper-middle, and high. Income is measured using GNI per capita, in US dollars, converted from local currency using the World Bank Atlas method. Estimates of GNI are obtained from economists in World Bank country units; and the size of the population is estimated by World Bank demographers from a variety of sources, including the UN's biennial World Population Prospects. Currently a LMIC is defined as having a GNI per capita of $1,006 to $3,955

	(https://datahelpdesk.worldbank.org/knowledgebase/articles/378834-how-does-the-world-bank-classify-countries).
Longitudinal study	In a longitudinal study, individual subjects are followed through time with continuous or repeated monitoring exposures, health outcomes, or both.
Low birthweight	Low birthweight is defined as less than 2,500g (up to and including 2,499g). Infants may be low birthweight because they are born too early or are unduly small for gestational age.
Lower reference nutrient intake (LRNI)	The estimated average daily intake of a nutrient which can be expected to meet the needs of only 2.5% of a healthy population. Values set may vary according to age, gender and physiological state (for example, pregnancy or breastfeeding).
Macronutrients	Nutrients that provide energy, including fat, protein and carbohydrate.
Malocclusion	Malocclusion describes the alignment of teeth which are considered not to be in a normal position in relation to adjacent teeth (that is, the teeth are not correctly aligned).
Margin of exposure	This approach provides an indication of the level of health concern about a substance's presence in food. EFSA's Scientific Committee states that, for substances that are genotoxic and carcinogenic, an MOE of 10,000 or higher is of low concern for public health.
Meta-analysis	A quantitative pooling of estimates of effect of an exposure on a given outcome, from different studies identified from a systematic review of the literature
Micronutrients	Essential nutrients required by the body in small quantities, including vitamins and minerals.
Nutrient deficiency	Impaired function due to inadequate supply of a nutrient required by the body.
Odds ratio (OR)	A measure of association between an exposure and an outcome. The OR represents the odds that an outcome will occur given a particular exposure, compared with the odds of the outcome occurring in the absence of that exposure. The OR is adjusted to address potential confounding.
Percentage point	A percentage point is the unit for the arithmetic difference between two percentages. For example, the difference between 30% and 33% is 3 percentage points.
Pre-post study	Also known as a before-after study. A study that measures outcomes in a group of participants before introducing an intervention, and then again afterwards. Any changes in the outcomes are attributed to the intervention. This study design cannot rule out that something other than the intervention may have caused a change. Randomised controlled trials (RCTs) are considered the most reliable way to show that your digital product has caused an outcome. However, it is not

	always possible to run an RCT. Before-and-after studies are more flexible and generally cheaper to run.
Randomised controlled trial (RCT)	A study in which eligible participants are assigned to two or more treatment groups on a random allocation basis. Randomisation assures the play of chance so that all sources of bias, known and unknown, are equally balanced.
Reference nutrient intake (RNI)	The average daily intake of a nutrient sufficient to meet the needs of almost all members (97.5%) of a healthy population. Values set may vary according to age, gender and physiological state (for example, pregnancy or breastfeeding).
Retinol equivalents (RE)	To take account of the contribution from provitamin A carotenoids, the total vitamin A content of the diet is usually expressed as micrograms (µg) of retinol equivalents (RE): 1µg RE = 1µg retinol = 6µg beta-carotene = 12 µg other carotenoids with provitamin A activity
Relative risk (RR)	The ratio of the rate of disease or death among people exposed to a factor, compared with the rate among the unexposed, usually used in cohort studies (World Cancer Research Fund & American Institute for Cancer Research, 2007).
Responsive feeding	A form of ‘responsive parenting’, in which parents are aware of their child’s emotional and physical needs and react appropriately to their child’s signals of hunger and fullness.
Risk factor	A factor demonstrated in epidemiological studies to influence the likelihood of disease in groups of the population.
Safe intake	Safe Intakes are set for some nutrients if there is insufficient reliable data to establish DRVs. They are based on a precautionary approach and are ’judged to be a level or range of intake at which there is no risk of deficiency, and below a level where there is a risk of undesirable effects (DH, 1991).
Solid foods	Foods other than breast milk or formula milk introduced to the infant diet at the commencement of complementary feeding.
Systematic review	An extensive review of published literature on a specific topic using a defined search strategy, with a priori inclusion and exclusion criteria.
Tolerable upper level (TUL)	A tolerable upper intake level (TUL) is intended to specify the level above which the risk for harm begins to increase and is defined as the highest average daily intake of a nutrient that is, likely to pose no risk of adverse health effects for nearly all persons in the general population, when the nutrient is consumed over long periods of time, usually a lifetime.
Total dietary energy intake (TDEI)	In this report, TDEI is used for consistency with previous SACN reports. However, in young children, this is equivalent to total energy intake because this age group, unlike adults, does not obtain energy from alcohol.

Verbal Intelligence Quotient (VIQ)	A numerical measurement of child's spoken language capabilities and limitations. It is used to gauge child's ability to reason out and understand others through spoken words.
Weaning	The process of expanding the diet to include foods and drinks other than breast milk or infant formula (DH, 1994). The term complementary feeding is preferred to describe diversification of the diet because 'weaning' has also been used to describe curtailment of breastfeeding.
Wechsler Intelligence Scale for Children (WISC)	An individually administered intelligence test for children between the ages of 6 and 16. It generates a Full Scale IQ that represents a child's general intellectual ability.
Young child	A child aged between 12 and 36 months (1 and three years).
Z-score	The z-score (or standard deviation (SD) score) is defined as the difference between an observed value for an individual and the median value of the reference population, divided by the standard deviation value of the reference population. Z-scores are used for height, weight and head circumference.

Annex 14: Abbreviations

AR	Adiposity rebound
BF	Body fat
BFMI	Body fat mass index
BMI	Body Mass Index
BMI SDS	Standardised BMI
BP	Blood pressure
CDC	US Centers for Disease Control
CFU	Colony-forming unit
CHD	Coronary heart disease
CI	Confidence interval
COMA	Committee on Medical Aspects of Food and Nutrition Policy
COT	Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment
CS	Cross-sectional study
CC	Case control study
DNSYIC	Diet and Nutrition Survey in Infants and Young Children
DRV	Dietary Reference Value
EAR	Estimated Average Requirements
EFSA	European Food Safety Authority
EU	European Union
FSIQ	Full-Scale Intelligence Quotient
g/day	Grams per day

Hb	Haemoglobin
HDL-C	High density lipoprotein cholesterol
HFSS	Foods high in (saturated) fats, salt and free sugars
HIC	High income country
HOME score	Home Observation Measurement of the Environment
HRP	Household reference person
ID or IDA	Iron deficiency or iron deficiency anaemia
IQ	Intelligence quotient
IU	International units
Kcal	Kilocalorie
Kg	Kilogram
Kj	Kilojoule
KS2	Key stage 2
LC-PUFA	Long chain polyunsaturated fatty acids
LDL-C	Low density lipoprotein cholesterol
LRNI	Lower Reference Nutrient Intake
MA	Meta-analysis
MMN	Multiple micronutrient(s)
NCMP	National Child Measurement Programme
NDNS	National Diet and Nutrition Survey

OR	Odds ratio
Oz	Ounce
PCS	Prospective cohort study
PLGV	Peak linear growth velocity
PPVT III	Peabody Picture Vocabulary test
PUFA	Polyunsaturated fatty acids
RCT	Randomised control trial
RE	Retinol equivalents
RNI	Reference Nutrient Intake
RoB	Risk of bias
RR	Relative Risk
SACN	Scientific Advisory Committee on Nutrition
SD	Standard Deviation
SDS	Standard deviation score
SE	Standard error
SES	Socioeconomic status
SMD	Standardised mean difference
SMCN	SACN Subgroup on Maternal and Child Nutrition
SSB	Sugars-sweetened beverage
TAG	Triacylglycerol
T2D	Type 2 diabetes
TDEI	Total dietary energy intake

UK	United Kingdom
VIQ	Verbal Intelligence Quotient
WISC	Wechsler Intelligence Scale for Children
WHO	World Health Organization
WHZ	Weight for height z score
WMD	Weighted mean difference