

How We Eat

Reviews of the evidence on food and eating behaviours related to diet and body size

A report commissioned by the Ministry of Health

Written by Sarah Gerritsen and Clare Wall

May 2017

Authors and acknowledgements

This report was written by Sarah Gerritsen and Clare Wall for the Ministry of Health. The authors are grateful to Kristie Saumure, Senior Reference Librarian at the Ministry of Health, who undertook the literature searches and initial selection of abstracts to review. Thank you also to Amy Lovell for her reviewing and summarizing the literature on infant feeding and role-modelling, and for assisting with editing.

The authors wish to thank the participants of the consultation and acknowledge the support and guidance provided by Harriette Carr and Louise McIntyre (Ministry of Health), and Mary Ann Carter (Health Promotion Agency).

Suggested citation: Gerritsen S and Wall C. 2017. *How We Eat: Reviews of the evidence on food and eating behaviours related to diet and body size*. Wellington: Ministry of Health.

Executive summary

This report presents the current evidence available about the effect of several eating behaviours ('how' we eat) on diet and body size. The six chapters contain summaries of high quality research about the nutrition-related behaviours related to: breastfeeding, parental feeding practices and parenting style, adult role modelling, responsive eating, mealtimes and food literacy. Each chapter also contains a summary of related New Zealand research. Evidence statements have been produced based on the research summaries, in order to inform policy and programmes about the promotion of healthy eating behaviour.

The evidence has been assessed using a process developed by the Australia National Health and Medical Research Council (NHMRC 2009). This method results in 'evidence statements' following a review of systematic reviews in the academic literature (sometimes called an overview of reviews, or a narrative review). The value of this method is that it collates evidence from many high-quality systematic reviews, giving weight to those findings that reoccur in multiple systematic reviews, and turns the evidence into information that can then be used in practical recommendations.

The evidence statements have been ordered in the executive summary by life stage. The statements have been given an overall grade (in blue) based on a summation of the rating for five components:

- Quantity, level and quality of the body of evidence
- The consistency of the body of evidence
- The potential impact of the proposed recommendation
- The generalisability of the body of evidence to the New Zealand population
- The applicability of the body of evidence to the New Zealand context.

For a summary of the research behind each statement, please refer to the relevant section of the report (in green).

Evidence statements for pregnant/breastfeeding mothers and partners

A supportive partner (with positive attitudes and beliefs about breastfeeding) improves breastfeeding intention, initiation and duration, and a woman's self-efficacy to breastfeed. **Family support for breastfeeding Grade A.**

Involving a women's partner and/or mother in breastfeeding education and support (both before and after birth) can have a positive influence on breastfeeding initiation and duration. **Family support for breastfeeding Grade A.**

Eating a wide variety of foods/flavours (including bitter vegetables such as broccoli and cauliflower) while pregnant and/or breastfeeding can improve a child's acceptance of vegetables in early childhood. **Parental feeding practices and parenting style Grade B.**

Evidence statements for parents and caregivers of children under five years

A nurturing and supportive parenting style helps children to maintain a healthy diet and body size. [Parental feeding practices and parenting style Grade A.](#)

Parental awareness and recognition of hunger and satiety cues can lead to small improvements in infant and toddler diet, food preferences and eating behaviours, and may be protective against excessive weight gain. [Responsive eating Grade B](#)

Parents of young children (under 5 years) should repeatedly offer a wide range of foods regardless of their own food preferences. Allow children to self-select from a wide variety of foods and encourage them to 'take one bite' of unfamiliar foods. [Parental feeding practices and parenting style Grade B.](#)

Using non-food related rewards, such as praise and encouragement, may increase young children's intake of fruits and vegetables when compared to repeated exposure alone. [Parental feeding practices and parenting style Grade B.](#)

Parental restriction of a child's intake (when they appear to eat too much) or pressuring a child to eat (when they appear to eat too little) are counterproductive, as these coercive practices can lead to poor dietary behaviours and increased body weight. [Parental feeding practices and parenting style Grade A.](#)

Parents should avoid strict food rules, and also, conversely, they should not give children the complete freedom to choose their food. [Parental feeding practices and parenting style Grade A.](#)

Setting limits on energy-dense foods and drinks in childhood (up to the age of 10 years) may protect against poor dietary intake and increased body weight. This is best done covertly, by limiting access to, or restricting portion size of, these foods and drinks so that the child is unaware. [Parental feeding practices and parenting style Grade A.](#)

Eating together as a family may improve child and adolescent diet quality and nutrition-related behaviours. There does not appear to be an effect on body size. [Mealtimes Grade B](#)

Watching TV while eating increases food intake in children, adolescents and adults, even in the absence of food advertisements. This effect may also be present with other screens (e.g. computers, phones). [Responsive eating Grade A](#)

Young children's sugar-sweetened beverage intake is influenced by parental role modelling. [Adult role-modeling of healthy eating Grade B.](#)

Early childhood teacher practices, particularly enthusiastic, positive role-modelling of healthy eating during mealtimes, may influence preschoolers' eating behaviours. [Adult role-modeling of healthy eating Grade C.](#)

Evidence statements for school-aged children, adolescents and their parents/caregivers

A nurturing and supportive parenting style helps children to maintain a healthy diet and body size. [Parental feeding practices and parenting style Grade A.](#)

Eating a healthy breakfast daily in childhood can lead to improvements in academic performance. [Mealtimes Grade A](#)

Regular frequency of eating (three or more times a day) may be related to lower body size in children and adolescents. [Mealtimes Grade A](#)

Eating a healthy breakfast daily (at all ages) appears to improve diet quality overall and may protect against weight gain, but is not associated with weight loss. [Mealtimes Grade B](#)

Adolescents are influenced by parental role modelling of eating breakfast. [Adult role-modeling of healthy eating Grade B.](#)

Eating together as a family may improve child and adolescent diet quality and nutrition-related behaviours. There does not appear to be an effect on body size. [Mealtimes Grade B](#)

Parental role modelling of fruit and vegetable consumption improves children's intake of fruit and vegetables. [Adult role-modeling of healthy eating Grade B.](#)

Watching TV while eating increases food intake in children, adolescents and adults, even in the absence of food advertisements. This effect may also be present with other screens (e.g. computers, phones). [Responsive eating Grade A](#)

Parental restriction of a child's intake (when they appear to eat too much) or pressuring a child to eat (when they appear to eat too little) are counterproductive, as these coercive practices can lead to poor dietary behaviours and increased body weight. [Parental feeding practices and parenting style Grade A.](#)

Parents should avoid strict food rules, and also, conversely, they should not give children the complete freedom to choose their food. [Parental feeding practices and parenting style Grade A.](#)

Setting limits on energy-dense foods and drinks in childhood (up to the age of 10 years) may protect against poor dietary intake and increased body weight. This is best done covertly, by limiting access to, or restricting portion size of, these foods and drinks so that the child is unaware. [Parental feeding practices and parenting style Grade A.](#)

Involvement in food preparation and cooking improves food literacy (the knowledge, skills and behaviours needed to make healthy food choices). Cooking classes in schools and community kitchens may assist with the development of skills and positive nutrition-related behaviours. [Food literacy Grade C.](#)

Gardening at school, when integrated into the wider curriculum, may improve children and young people's access to, preference for, and consumption of vegetables and fruits. [Food literacy Grade C.](#)

Evidence statements for adults

Eating a healthy breakfast daily (at all ages) appears to improve diet quality overall and may protect against weight gain, but is not associated with weight loss. [Mealtimes Grade B](#)

Adults who are concerned about weight maintenance or weight loss should focus on energy intake over the day rather than eating frequency, as there does not appear to be an association between number of eating occasions a day and body size. However, a greater number of eating occasions can result in higher energy intake. [Mealtimes Grade A](#)

Being mindful and paying attention to food while eating, then stopping eating when feeling full, helps to regulate eating patterns and improve unhealthy weight control behaviours in adults. It is unclear if these techniques have an effect on weight loss and weight maintenance. [Responsive eating Grade B](#).

Watching TV while eating increases food intake in children, adolescents and adults, even in the absence of food advertisements. This effect may also be present with other screens (e.g. computers, phones). [Responsive eating Grade A](#)

Involvement in food preparation and cooking improves food literacy (the knowledge, skills and behaviours needed to make healthy food choices). Cooking classes in community kitchens may assist with the development of skills and positive nutrition-related behaviours. [Food literacy Grade C](#).

List of abbreviations

BMI	Body mass index (weight in kgs divided by height squared in metres)
CNS	2002 New Zealand Children's Nutrition Survey
CS	Cross-sectional study
NHMRC	National Health and Medical Research Council (Australian Government)
NZ	New Zealand
OR	Odds ratio
PCS	Prospective cohort study
QES	Quasi-experimental study
QUAL	Qualitative research
RCT	Randomised controlled trial
SR	Systematic review
USA	The United States of America

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Introduction

This report presents narrative summaries of academic literature providing the current evidence about the effect of eating behaviours, 'how' we eat, on diet and body size. This work complements the Eating and Activity Guidelines that focus predominantly on *what* people should eat, rather than *how* they should eat. The information in How We Eat can be used to inform policy and programmes about the promotion of healthy eating behaviour. The evidence statements can be further developed into public health messages and recommendations for parents, caregivers and the public.

The context and aims of this report

In 2015, the Ministry of Health released new Eating and Activity Guidelines for New Zealand Adults (Ministry of Health 2015). Over time, the Eating and Activity Guidelines will be extended to encompass the whole population. Related to the Guidelines are a series of issue-based documents that provide more detail on particular topic areas. How We Eat is one of these issue-based documents, providing context and additional information to supplement the Guidelines.

How We Eat also supports the Ministry of Health's Childhood Obesity Plan (Ministry of Health 2016). Obesity is New Zealand's leading modifiable risk factor for health loss. A number of diseases, including type 2 diabetes, ischaemic heart disease, ischaemic stroke and some cancers, are associated with excess body weight. There has been a dramatic increase in the global prevalence of obesity. In 2012 New Zealand adults ranked third highest out of 15 OECD countries for measures of obesity; in 2010 New Zealand children (aged 5–17 years) ranked third highest out of 40 countries for overweight and obesity (Ministry of Health 2015b). The determinants of obesity are complex, but essentially this dramatic global rise in excess body size is driven by changes in the food system which have resulted in a greater availability and promotion of cheap, energy-dense, nutrient-poor foods (Swinburn et al 2011). It is within this context of abundant food that the development of healthy eating behaviours becomes particularly salient.

How We Eat aims to:

- use a systematic framework to summarise the available evidence on eating behaviours related to diet and body size,
- assess the relevance of this evidence to the New Zealand population, and
- provide evidence based statements that can be used to inform policy and programmes about the promotion of healthy eating.

In the last 10 years there has been an increase in the number of studies about eating behaviours, with several systematic reviews now providing clarity around the evidence for the effect of some eating behaviours on health. Other countries have similarly taken steps to evaluate the role of some eating behaviours in nutrition-related outcomes (for example, Australia, the USA, Brazil) and this report has drawn on their findings where appropriate. It is timely to undertake a review of the many high-quality systematic reviews on eating behaviours in order to provide a useful reference for policy makers and practitioners.

The focus of this report

How We Eat has a particular focus on:

1. children and the development of eating behaviours early in life
2. families and whānau, and their role in developing child eating behaviours
3. the diversity of peoples in New Zealand, including Māori, Pacific peoples, and people with low incomes
4. individual-level eating behaviours within wider social, physical and economic contexts.

Children and the development of eating behaviours early in life

How We Eat covers eating behaviours throughout the life course from pregnancy and early life through to older age, but has a particular focus on children. Adequate nutrition in early life, including in utero, is critical for healthy child development. Many adult eating behaviours, food preferences, and attitudes toward food have their roots in childhood (Lipsky et al 2015), and there is strong evidence of dietary pattern tracking from infancy to preschool (Lioret et al 2015), early childhood through childhood (Wall et al 2013), from childhood to adolescence (Emmett et al 2015), and into adulthood (Lipsky et al 2015).

Early childhood is a period in the lifecourse characterised as having ‘high plasticity’ and ‘rapid transitions’ and therefore amenable to behavioural change. Parents and caregivers have a high degree of control over their child’s food environment and experiences, and consequently, a young child’s dietary patterns and behaviour appear to be easier to influence than older children and adults (Birch and Anzman 2010).

Additionally, there is growing evidence that the risk of excess body weight in childhood and adulthood is present early in life, during gestation and even before pregnancy via maternal weight and epigenetic influences from the prior generation. The developmental and intergenerational effects of obesity create an ongoing cycle of obesity risk and transmission, suggesting that early-life interventions hold the most promise (Nader et al 2012). A key recommendation in the final report of the World Health Organization’s Commission on Ending Childhood Obesity was the need for governments to take leadership on providing “guidance on, and support for, healthy diet, sleep and physical activity in early childhood to ensure children grow appropriately and develop healthy habits” (World Health Organization 2016). This report can assist with the implementation of this recommendation in regards to eating behaviours.

Families and whānau, and their role in developing child eating behaviours

How We Eat focuses on eating behaviours that occur within family and whānau. Families and whānau take many diverse forms in New Zealand but all have an important role in not only providing members with ‘what’ to eat, but also in socialising and guiding children about ‘how’ to eat. Families are a key social environment for child development of eating patterns and food preferences (Delormier et al 2009). Most New Zealand families are well-placed to perform these core families functions, but there is also a number of families who face adversity and may find it difficult to perform these roles (Social Policy and Evaluation and Research Unit 2016). The 2008/09 Adult Nutrition Survey found 59% of households were fully or almost food secure (i.e. they have access to sufficient food that is nutritious, safe and of good quality, in a way that meets cultural needs and has been acquired in socially acceptable ways). Māori, Pacific and low-income families were more likely

than other New Zealanders to experience food insecurity (University of Otago and Ministry of Health 2011). A series of research projects undertaken in 2007-08 investigated environmental influences on food security and physical activity among Māori, Pacific, and low-income families/whānau (the ENHANCE programme). The key intervention areas proposed from that work to enhance food security for Māori, Pacific and low-income families were: availability of money within households; the cost of food; and food purchasing factors (Bowers et al 2009).

A large literature review on the contribution of the family environment to food habits or behaviours in New Zealand children was undertaken by the Scientific Committee of the Agencies for Nutrition Action (ANA) covering studies published from 1996 to 2007 (Brown et al 2008). In the last ten years, many more studies have been done in the area of eating behaviours, with several systematic reviews now providing clarity around some of the topics included in the ANA review.

The diversity of peoples in New Zealand, including Māori, Pacific and people with low incomes

One of the aims of How We Eat was to examine the evidence for its generalisability to the diversity of peoples in New Zealand, including Māori, Pacific and Asian communities, and people with low-incomes. However, the majority of systematic reviews and studies on eating behaviours do not examine the differential effect of a particular behaviour on the diet and body size for different ethnic or socioeconomic groups, and very few interventions consider the health equity impact. It is therefore often difficult to consider if the findings from (largely overseas) total population studies are applicable to the different populations within New Zealand.

Two systematic reviews of nutrition and obesity prevention interventions where analyses by socioeconomic group have been presented, concluded that information-based interventions generally risk increasing existing health inequalities. The most successful interventions for people of low incomes were of a long duration with some environmental, structural, community or social support for behavioural change (Beauchamp et al 2014; McGill et al 2015). These findings should be taken into account when using, implementing, or disseminating the evidence statements contained in How We Eat.

Individual eating behaviours within social, physical and economic contexts

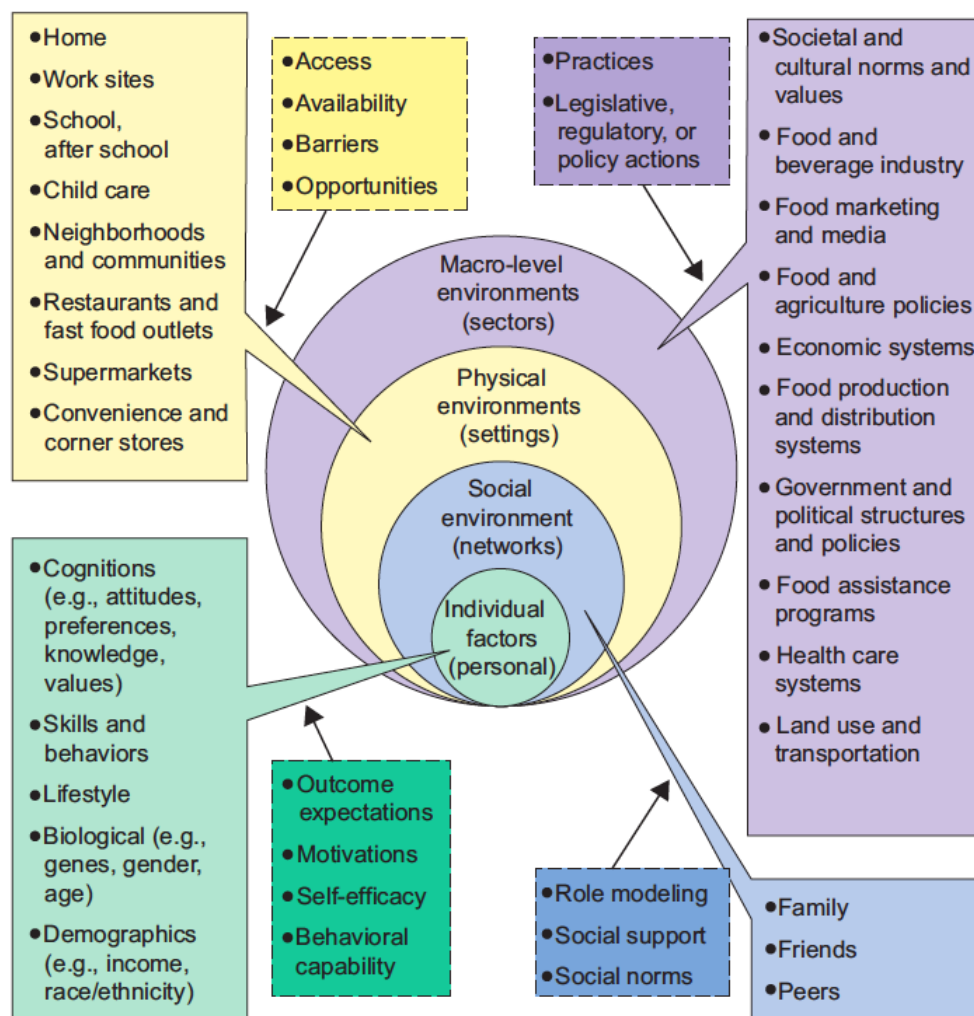
Eating is a complex social and cultural practice, influenced by many factors from individual-level factors through to macro-level social, physical and economic factors (see Figure 1). Individual-level factors related to food choices and eating behaviours include cognitions, behaviours, and biological/genetic and demographic factors. Some individual-level factors are not easily 'modifiable' (they may be impossible or difficult to change) but other behaviours may be impacted by a person's motivation, self-efficacy (belief that they can change the behaviour), knowledge, expectations, and their capability or capacity to change.

Eating behaviours are particularly influenced by environmental contexts, as shown by the outer concentric circles of Figure 1. Environmental contexts related to eating behaviours include social environments, physical environments, and macro-level environments. The social environment (family, whānau, friends, peers and community) may impact food choices through mechanisms such as role modelling, social support, and social norms. The physical environment (settings where people eat or procure food such as the home, work sites, schools, restaurants, and supermarkets) influences

which foods are available to eat and impacts barriers and opportunities that facilitate or hinder healthy eating. Macrolevel environmental factors (such as food production and marketing, and government policy) play a more distal and indirect role but have a substantial and powerful effect on what people eat (Story et al 2008). An examination of the food environment in New Zealand was undertaken in 2013, providing an assessment of the implementation of policies on food environments compared to international best practice. The authors state that food environments in New Zealand are major drivers of unhealthy diets and obesity (Swinburn et al 2014).

How We Eat has a particular focus on modifiable individual eating behaviours, while acknowledging that these behaviours form, occur, and are impacted by, the wider context of social, physical and macro-level environmental factors as shown in Figure 1. Successful public health messaging to improve individual eating behaviours can only occur when the change in behaviour is meaningful, socially acceptable and facilitated through adequate resources, that is, when multiple influences at multiple layers in the system are working together to promote healthy eating (Campbell 2016).

Figure 1: An ecological framework depicting the multiple influences on what people eat, reproduced from Story et al (2008)



Methods used to review the evidence and formulate evidence statements

How We Eat is a series of ‘overview of reviews’ (also known as a meta review or narrative review). An overview of reviews is a summary that compiles information from individual systematic reviews relevant to a single issue or question (Tsagris and Fragkos 2016). Systematic reviews collect and critically appraise multiple research studies or papers using objective and transparent standard techniques to ensure that all relevant research on a topic can be reviewed. Systematic reviews are often lengthy and detailed. In contrast, an overview of reviews is intended to be brief; the narrative focusing on the outcomes, methods and results of the included systematic reviews. The value of an overview of reviews is that it collates evidence from many high-quality systematic reviews, giving weight to those findings that reoccur in multiple systematic reviews, thereby offering a useful reference for decision makers (Tsagris and Fragkos 2016).

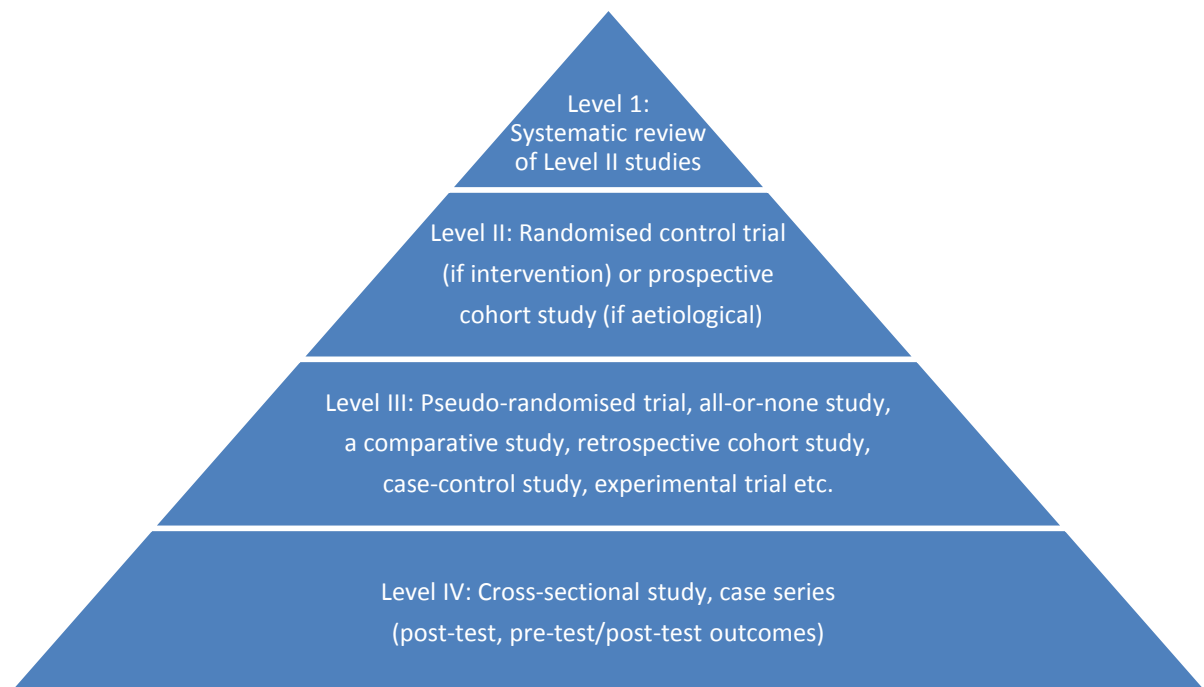
In September and October 2016, systematic searches of several databases (Medline, Cochrane, Scopus, Embase, PsycInfo, Index New Zealand, Kiwi Research Information Services) were performed by a Ministry of Health librarian using key words related to the research questions for How We Eat, looking for academic literature from January 2005 to September 2016. Additional articles published between September 2016 and January 2017 were included by the authors if particularly relevant. A summary of key terms used and process for the literature searches is contained at the start of each chapter in this report, and the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) flow diagrams show the number of studies returned in the database searches and the reasons for excluding papers from the review (Moher et al 2009). Literature searches and the initial removal of unrelated articles were performed by a Senior Reference Librarian at the Ministry of Health. The two authors then independently assessed the abstracts, and collectively reached agreement on the selection of articles to be used in the narrative review of the literature to inform the body of evidence statements. Sometimes a paper on an individual study may have been included in the review, particularly if it was about a recent high-quality randomised controlled trial or prospective cohort study which had not been captured in a systematic review, but most of the papers chosen for inclusion were systematic reviews. See Appendix 1 for full details of inclusion and exclusion criteria. Full texts of selected papers were appraised and summarised in tables to examine the study design, participants or population of interest, study size, variables of interest (intervention or comparators), results or outcome, overall effect on risk and quality of the study or review (as shown in Appendix 2).

Following the completion of the summary table for each topic, a narrative review of the papers—the “body of evidence”—was written. To ensure a systematic and transparent procedure for summarising each body of evidence, the authors followed a predetermined protocol based on the National Health and Medical Research Council (NHMRC) levels of evidence and grades for recommendations (NHMRC 2009). The NHMRC levels of evidence are a well established criteria for appraising evidence about prevention and treatment in clinical medicine (a process often referred to as ‘evidence-based medicine’). A review of the NHMRC process in 2009 ensured its application to a wider range of guideline development purposes than clinical medicine (Merlin et al 2009), and there have been several applications in public health and nutrition to produce robust evidence-informed policy using this method, e.g. the 2009-10 review of Australian Dietary Guidelines (Allman-Farinelli et al 2014). However, this application is not without difficulty, primarily because the best study design for determining a causal relationship between an intervention and an outcome is a well conducted

randomised controlled trial (RCT). RCTs can be impractical or unethical in the instance of a nutrition community-based or infant/child intervention (Allman-Farinelli et al 2014; Katz et al 2001) and are often inappropriate for aetiological questions (i.e. investigations of the cause of disease) in public health and epidemiology (Kohatsu et al 2004). Very few RCTs are conducted for long enough periods to assess long term health outcomes and so prospective cohort studies often provide more important evidence for the development of dietary guidelines than reviews which summarise only small short-term randomised controlled trials (Australian Government Department of Health and Ageing 2011). Additionally, it should be noted that there are differences in the capacity of competing stakeholders (in a policy decision making process) to generate evidence. Certain types of research and interventions may be more likely to be supported or funded, and often the 'best' evidence (i.e. RCTs) are conducted on the easiest to reach groups in a population, which may explain the lack of research evidence available for some disadvantaged communities (Rychetnik et al 2002).

The revised NHMRC 'levels of evidence' (Figure 2) go some way to addressing these concerns by recognising the importance of prospective cohort studies in answering many aetiological questions. Figure 2 shows the hierarchy used in How We Eat to categorise research by type of study, with those studies at the top deemed to be of the highest quality or level of evidence. To be included in this report, a topic needed to have at least one study which would be considered 'Level 1' in the NHMRC framework, that is, a systematic review of randomised control trials or prospective cohort studies (Figure 2).

Figure 2: Levels of evidence used in How We Eat, based on the NHMRC framework (2009)



Importantly, the level of evidence is only one aspect of five that determines the overall quality of the evidence used to formulate an evidence statement (NHMRC 2009). The NHMRC process also considers:

- Quantity, level and quality of the evidence
- The consistency of the evidence
- The potential impact of the proposed recommendation (the magnitude of the problem or the widespread nature of the behaviour)
- The generalisability of the body of evidence to the New Zealand population
- The applicability of the body of evidence to the New Zealand context.

The wording for each statement in How We Eat has been developed by the authors based on the body of evidence, with the wording reflecting the strength of the body of evidence. An overall grade was assigned to each statement based on a summation of the rating for each individual component of the body of evidence as bulleted above (NHMRC 2009). More detail on the NHMRC process is contained in Appendix 1.

Topics and research questions

Six broad topics were selected to focus the scope of the How We Eat project, following consultation with key experts on nutrition and public health (see Appendix 1 for more information on the consultation process and decisions on scope). The research questions below each topic were developed to guide the literature searches.

- 1. Family support for breastfeeding:** *Does partner and/or family and whānau support for breastfeeding affect initiation and/or duration of breastfeeding?*
- 2. Parental feeding practices and parenting style:** *Does repeated exposure to novel foods and non-food rewards (praise, encouragement, stickers) improve diet in early childhood? Do coercive food practices (controlling or restricting children's diet, pressure to eat, punishment and rules) affect child diet and/or body size? Does general parenting style and/or feeding style affect child diet and/or body size?*
- 3. Role-modelling of healthy eating:** *Does parental role-modelling of healthy eating behaviours affect child and/or young people's eating behaviours and diet? Does teacher role-modelling of healthy eating behaviours affect child diet and body size?*
- 4. Mealtimes:** *Does eating or skipping breakfast affect diet and/or body size? Does the number of meals-per-day/eating-occasions-per-day affect diet and/or body size? Do families eating together (family mealtimes) affect diet and/or body size?*
- 5. Responsive feeding and eating:** *Do responsive feeding practices affect infant and young child diet and body size? (e.g. the recognition of satiety cues) Does limiting distractions while eating (including turning off screens/TV) improve child diet and body size? Do responsive eating techniques (recognising hunger, satiety, mindful/attentive eating) affect adult diet and body size?*
- 6. Food literacy:** *Does gardening affect diet and/or body size? Does involvement in meal selection, preparation and cooking affect child diet and/or body size?*

Two of the research questions initially included did not have enough of an evidence base to allow for the formulation of an evidence statement. These questions, with reference to the small body of literature that was uncovered during the searches for this project, were:

Does eating with others affect adult and/or older adults' diet and/or body size, outside the family situation?

Two randomised controlled trials (3 studies in total) have looked at the effect of residents in rest-homes eating together on energy intake, malnutrition and/or body size (Nijs et al 2006b; Wright et al 2006; Nijs et al 2006a) finding them to be positively associated with weight maintenance and improvements in nutritional status. There are no systematic reviews on this topic.

Does the speed of eating affect diet and/or body size? [meal duration]

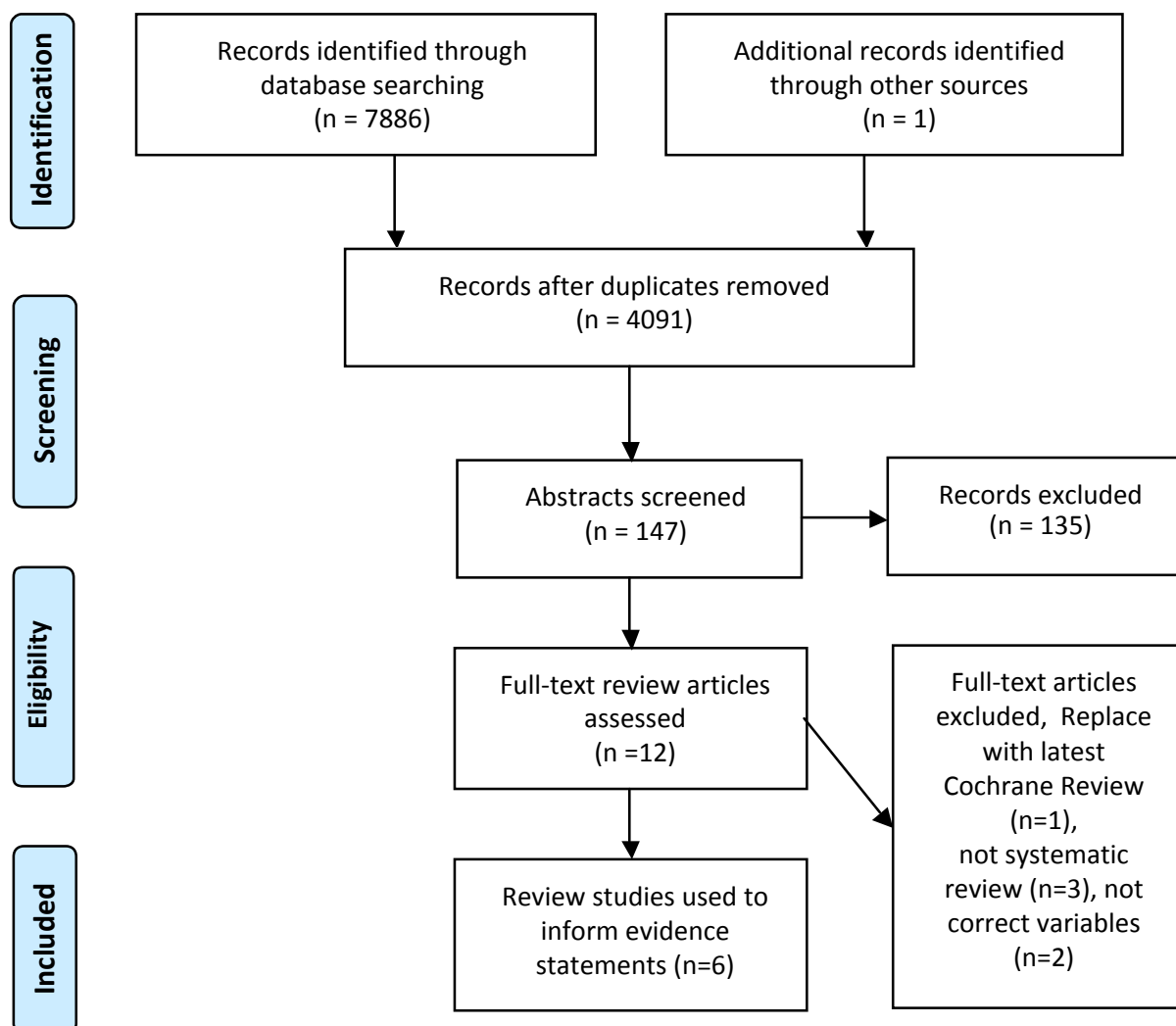
There has been one systematic review containing eight cross-sectional studies including children, adolescents and adults, largely undertaken in North East Asia (Mesas et al 2012) on the speed of eating or meal duration. There is variation in the adjustment for confounders between the eight studies making it difficult to compare the results of studies in this area, but all found an association between eating fast(er) and overweight, and one found an association with metabolic syndrome.

Family support for breastfeeding

Literature search

Figure 3 outlines the literature search process followed to review the evidence about family (whānau, father, partner, spouse, husband, paternal, wife, grandparent, grandmother, grandfather, sister etc.) support for breastfeeding initiation and duration. For the literature search strategy and criteria, and an explanation of the method followed to assess the evidence and develop the evidence statements, see Appendix 1.

Figure 3: Family support for breastfeeding literature search



Does family support for breastfeeding affect initiation and/or duration?

Evidence statement	A supportive partner (with positive attitudes and beliefs about breastfeeding) improves breastfeeding intention, initiation and duration, and a woman's self-efficacy to breastfeed.	
Grade	A	
Evidence statement	Involving a women's partner and/or mother in breastfeeding education and support (both before and after birth) can have a positive influence on breastfeeding initiation and duration.	
Grade	A	
Component	Rating	Notes
Evidence base	Good	Four Level-1 SR, 1 Level-IV review and 1 QUAL review. See Appendix 2 Table 1 for details of the studies used to inform this evidence statement
Consistency	Excellent	
Impact	Excellent	
Generalisability	Good	
Applicability	Good	

Summary of key studies used for the evidence statement

Women's attitudes and practices about breastfeeding are influenced by specific people in their social environment, namely the baby's father, maternal grandmother, close friends, and health care workers (Meedyia et al 2010). Qualitative analysis of breast feeding studies that have investigated the broad aspects of a mother's experience, have found a dominant theme of "A need for support" (Nelson 2006). Partners and maternal grandmothers were listed by mothers as the most significant sources of emotional and instrumental support in the early post partum period.

"The number one thing that made [breastfeeding] easier is my family. They let me know that, you know, they wanted me to know that this is great. You're really doing a great job" (Nelson 2006)

The attitude of the woman's partner to breast feeding is crucial as the father's involvement enhances maternal and infant wellbeing due to the provision of day-to-day support compared to intermittent help from a healthcare professional (Meedyia et al 2010). In a review of studies with adolescents, those who reported that someone had talked to them about breastfeeding (particularly a family member or the infant's father) were more likely to report an intention to breastfeed, with a positive dose relationship between greater perception of paternal and peer support and intention to breastfeed (Hall Moran et al 2007).

Despite the recognition that the male partner plays an important role in supporting the initiation and duration of breastfeeding, male partner-focused interventions have not been thoroughly investigated in the literature. Four randomised controlled trials of educational programmes aimed to strengthen male partner support for breastfeeding were identified in a specific systematic review on this (Mitchell-Box and Braun 2013). All four on these intervention (three hospital-based, one clinic-based) resulted in significant improvement in breastfeeding outcomes. Three of the studies reported a significant effect on exclusive breastfeeding duration. Interventions aimed at increasing male partner support suggest male-targeted education is an effective way to increase breastfeeding

initiation and exclusivity. They should aim to enhance knowledge by empowering men to be more involved with the breastfeeding decision, provide advice on how to become more involved in breastfeeding, and increase their comfort of breastfeeding in public (Mitchell-Box and Braun 2013). Results from a hospital-based randomised controlled trial which included expectant fathers showed that women whose partners attended breastfeeding classes were significantly more likely to initiate breastfeeding compared to those whose partners only attended baby care classes only (Wolfberg et al 2004). When women and their partners are involved together in breastfeeding classes this allowed them to explore strategies and make plans to support each other (Meedya et al 2010).

Evidence suggests that support from grandparents, particularly the infant's grandmother (maternal or paternal) plays a central role in making decisions on infant rearing within the family unit (Negin et al 2016). The influence and effects that grandmother's (particularly maternal grandmother's) have on breastfeeding has only been explored in two reviews (Negin et al 2016; Inoue et al 2012). Negin et al (2016) assessed the impact grandmothers had on breastfeeding rates and duration due to grandmother attitudes and experience of breastfeeding, the impact on breastfeeding rates and duration when the grandmother was the main caregiver, and the impact of grandmother's education level on breastfeeding rates and duration. Positive impacts were seen if grandmothers had their own experience of breastfeeding, or were positively inclined towards breastfeeding with a 1.6 to 12.4 increase in likelihood of exclusive breastfeeding or refraining from introducing solid food. Although there were differences in the type of breastfeeding outcome analysed and measurement of the grandmother's influence, the overall effect on breastfeeding was positive (Negin et al 2016). Providing an opportunity for grandmothers to discuss their breastfeeding perceptions and experiences with the mother can be a helpful intervention to support breastfeeding (Meedya et al 2010). The impact of maternal grandmother's on adolescent breastfeeding mother's was explored in one review which included qualitative studies. This review found that participants' mothers were pivotal in the decision making regarding baby feeding choice, as adolescents respected their mother's advice in similar vein to that of an expert (Hall Moran et al 2007).

Negative impacts of grandmothers on breastfeeding were found in three studies included in the Negin et al (2016) review and in one study in the Inoue et al. (2012) review. Mothers were up to 3.6 times more likely not to initiate breastfeeding after birth when the maternal grandmother had a negative attitude towards breastfeeding, and was 4.3 times more likely to practice non-exclusive breastfeeding when the grandmother was the primary caregiver (Negin 2016). Inoue et al (2012) found an association between maternal grandmother's negative attitude towards breastfeeding and shorter duration, and that not living with grandparents had a positive association with breastfeeding status at six months after birth compared with those who lived with grandparents (Inoue 2012). These findings from Japan may be specific to cultural customs in Japan where mothers often return to their hometowns for delivery and the post partum period (Inoue 2012). Further research is required into this topic to delineate the extent of a grandmother's impact and other potential factors that contribute to their influence.

Research on social support is generally positive. The inconsistencies seen with regards to the role of social support may be due to inconsistencies in definitions across studies, and a lack of understanding of how social support works (Meedya et al 2010). Two reviews identified ambiguity in the definition of exclusive breastfeeding, with recommendations for further studies to be conducted using the World Health Organization definitions to categorise breastfeeding outcomes (Mitchell-Box

and Braun 2013). A recent Cochrane review identifying the benefits of support in duration of breastfeeding (Balogun Olukunmi et al 2016) was excluded from this analysis as it only focuses on support from professionals and does not include support that may come from the mother's partner, family members and her own social support network.

Key references used to inform the evidence statement

Negin J, Coffman J, Vizintin P, et al. 2016. The Influence of Grandmothers on Breastfeeding Rates: A Systematic Review. *BMC Pregnancy & Childbirth* 16(1): 91.

Mitchell-Box K, Braun KL. 2013. Impact of Male-Partner-Focused Interventions on Breastfeeding Initiation, Exclusivity, and Continuation. *Journal of Human Lactation* 29(4): 473-479.

Inoue M, Binns CW, Otsuka K, et al. 2012. Infant Feeding Practices and Breastfeeding Duration in Japan: A Review. *International Breastfeeding Journal* 7(1): 15.

Meedya S, Fahy K, Kable A. 2010. Factors that Positively Influence Breastfeeding Duration to 6 Months: A Literature Review. *Women & Birth* 23(4): 135-145.

Hall Moran VH, Edwards J, Dykes F, et al. 2007. A Systematic Review of the Nature of Support for Breast-Feeding Adolescent Mothers. *Midwifery* 23(2): 157-171.

Nelson AM. 2006. A Metasynthesis of Qualitative Breastfeeding Studies. *Journal of Midwifery & Women's Health* 51(2): e13-20.

Partner and family/whānau support for breastfeeding in New Zealand

The Growing Up in New Zealand study, following the development of children born in the Auckland, Counties Manukau and Waikato regions in 2009/10, interviewed a sample of 6384 mothers when their babies were 9 months of age (Morton et al 2012). Berry (2016) reported that 89% of the Growing Up mothers with strong support from their partners to breastfeed, successfully breastfed their baby to at least one month of age, compared with 75% of mothers who reported that they received no support from their partner to breastfeed.

Edwards and Rangipohutu (2014) explain that alongside the midwife, the partner and whānau play important roles in the *ukaipotanga* (nurturing) process which acts to optimise and promote women's breastfeeding and contributes to *whānau ora*, knowledge and skills in supporting mothers. Qualitative research on the role of whānau in Māori women's decision to breastfeed was conducted in New Zealand from 2004 to 2006. Two studies used semi-structured interviews of 30 (Glover et al 2006) and 59 (Glover et al 2009) women who identified as Māori and who had cared for a newborn baby within the previous three years, alongside 11 and 27 whānau members respectively (including mothers, male/female partners, aunts, sisters, and cousins). The women's partners, mothers, sisters, and aunts were cited most often as having a role in the decision to breastfeed and in supporting breastfeeding (Glover et al 2006). Recent qualitative research with 11 Māori women and two whānau in Taranaki by Reinfelds(2015) also found emotional and practical support from partners and whānau to breastfeeding women was an important determinant of breastfeeding.

Glover (2009) found that although mothers and whānau members felt positively towards breastfeeding and in general expected to exclusively breastfeed, their expectations were often not

met due to a lack of support to establish breastfeeding, help when circumstances change, confusion, and a lack of timely culturally-relevant information. Ambiguity around the appropriateness of bed sharing, smoking whilst breastfeeding and a perception of a lack of acceptability of breastfeeding in public were also seen as barriers (Glover 2009).

Glover (2009) found that partner's involvement in antenatal and infant-feeding ranged from no involvement at all to attendance at all antenatal visits and actively seeking lactation support. Some comments from mothers suggested partners feeling left out as a result of the focus on mother and baby, and concluded that there was a need to educate fathers about breastfeeding and support their inclusion in infant care. The significance of this supportive role needs to be acknowledged and encouraged (Reinfelds 2015 and Glover 2006). Infant feeding usually was discussed during one-on-one conversations, with traditional advice more likely to come from mothers, mothers-in-law, nannies, cousins, and Māori midwives (Glover 2006). Traditional infant feeding practices, i.e. breastfeeding, appeared to have been replaced in some whānau with a new "tradition" of bottle feeding, creating a tension when women "break the cycle" by choosing to breastfeed (Glover 2006).

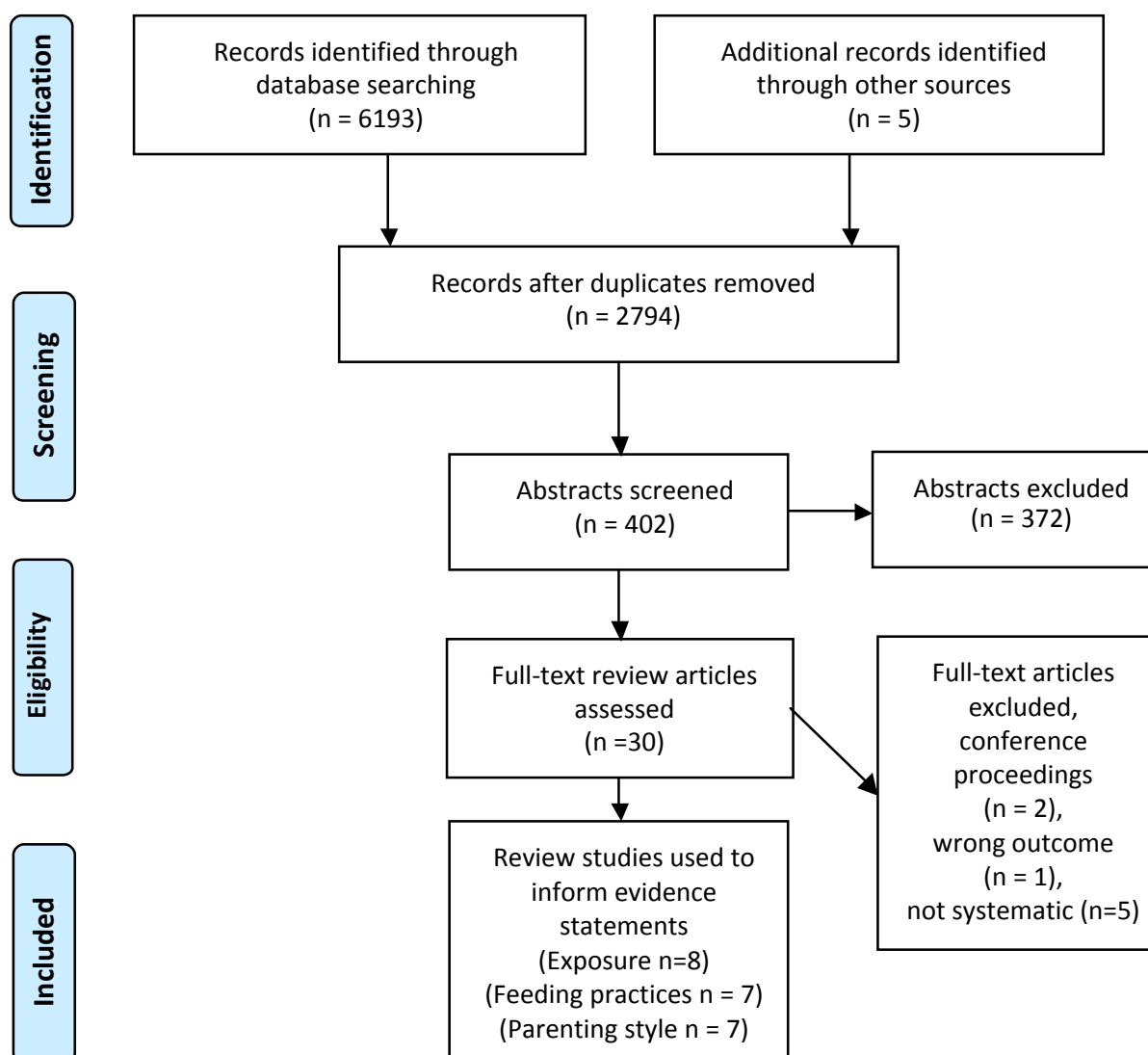
Whānau are a significant source of advice and support to mothers, but their ability to impart good advice remains influenced by their own positive breastfeeding experiences and access to clear, accurate, and culturally relevant information (Glover 2009). Glover's research (2006 and 2009) supports the notion that whānau are a central component and can be called upon to support healthy choices. Best practice guidelines should be presented in a way that is consistent with Māori belief systems which includes having a focus on whānau as well as mothers, and builds on whānau capacity and capabilities related to breastfeeding support from the antenatal period (Reinfelds 2015).

Parental feeding practices and parenting style

Literature search

Figure 4 outlines the literature search process followed to review the evidence about feeding practices (food rules, treats, instrumental feeding, repeated taste exposure, novel food acceptance), and parenting style (authoritative, authoritarian, protective, uninvolved, neglectful, attachment, permissive) related to diet and body size. For the literature search strategy and criteria, and an explanation of the method followed to assess the evidence and develop the evidence statements, see Appendix 1.

Figure 4: Parenting style and food rules literature search



Does repeated exposure to novel foods improve diet in early childhood?

Evidence statement	Eating a wide variety of foods/flavours (including bitter vegetables such as broccoli and cauliflower) while pregnant and/or breastfeeding can improve a child's acceptance of vegetables in early childhood.	
Grade	B	
Evidence statement	Parents of young children (under the age of 5 years) should repeatedly offer a wide range of foods regardless of their own food preferences. Allow children to self-select from a wide variety of foods and encourage them to 'take one bite' of unfamiliar foods.	
Grade	B	
Evidence statement	Using non-food related rewards, such as praise and encouragement, may increase young children's intake of fruits and vegetables when compared to repeated exposure alone.	
Grade	B	
Component	Rating	Notes
Evidence base	Good	Four Level-I SR and three recent Level-III RCTs. See Appendix 2 Table 2a for details of the studies used to inform this evidence statement
Consistency	Satisfactory	For bitter foods
Impact	Satisfactory	
Generalisability	Good	
Applicability	Good	

Summary of key studies used for the evidence statement

It is accepted in clinical practice that repeated exposure to a variety of flavours during infancy increases acceptance of fruits and vegetables in childhood and can assist with obesity prevention. However, parents may be unaware of this and will often not persist in presenting new foods if they are initially rejected (Birch and Anzman 2010). There is a growing body of literature available on repeated exposure of novel foods and early weaning practices (e.g. Howard et al 2012; Hetherington et al 2015), and one systematic review specifically about increasing vegetable consumption (Hendrie et al 2017). The Hendrie et al. review of interventions associated with increasing vegetable consumption in 2-12 year old children found that overcoming aversion to the bitter and unfamiliar textures of vegetables requires repeated exposure and long term positive reinforcement in order for children to begin to like such foods. Persistent repeated vegetable exposure in early childhood, prior to starting school is likely to be an important factor in the formation of taste preferences (Hendrie et al 2017). It is clear from research to date that parents need to be encouraged to offer a wide range of foods regardless of their own food preferences, and need guidance on managing food neophobia (Howard et al 2012).

One systematic review has investigated early exposure to specific tastes (sugar, salty, bitter, umami and sour) and acceptance of those same tastes later in life (Nehring et al 2015). The review included six randomised-controlled trials and three quasi-experimental design studies of in utero and early

infant taste experiences on later taste acceptance. All studies followed a similar structure where either the foetus or infant were exposed to a specific food or taste once or over several days/weeks, with mediums of exposure ranging from in utero (n=3), breast milk (n=4), formula (n=5), puree (n=6) and solid food (n=1). The sensitivity analysis based on 29 subgroups from intervention studies showed exposure to sweet taste had both positive and neutral effects on later intake of sweet flavoured foods (n=3 showed increased intake, n=7 showed no change in intake). It was hypothesised that sweet tastes are innately preferred, which may limit the further programming of sweet taste acceptance. In comparison, exposure to bitter tastes through the use of a formula increased the intake of bitter flavours in four out of five subgroups, supporting the theory that liking of bitter tastes (such as broccoli and cauliflower) is learnable if introduced early. A randomised controlled trial in the Netherlands suggested that early weaning exclusively with vegetables resulted in a higher daily vegetable consumption until at least 12 months of age with further research required into the long term maintenance of this effect (Barends et al 2014). Exposure to salty tastes did not act on increasing the intake of salted food in the intervention studies. Conclusions on sour taste acceptance following exposure were indeterminate, as only two subgroups examined this relationship. Later food acceptance was assessed after short time intervals following exposure and the description of exposure was not well defined. Therefore, it was unclear whether the findings obtained indicate long-term programming, even though there is some evidence to suggest that early food habits track into later childhood (Nehring et al 2015).

Two systematic reviews have concluded that multi-component interventions in preschool settings which incorporate a parent or family as part of the programme, provide the strongest evidence for improving fruit and vegetable intakes (Hendrie et al 2017; Ward et al 2015). A significant proportion (around 80%) of children between the ages of three and five years living in developed countries receive childcare outside of their home (Ward et al 2015). Although parents remain the primary caregivers of children, the influence from other adults and peers in settings such as childcare can have a profound effect on the quality of children's diet (Ward et al 2015). Ward et al found 15 studies that evaluated childcare educator's practices with regards to physical activity and nutrition. Five nutrition-related studies were included, of which three, one prospective cohort study and two quasi-experimental studies reported on exposure with or without use of non-food rewards. Immediate positive reinforcement (verbal and a sticker) compared to no positive reinforcement, the use of non-food rewards had significant effects on novel food (i.e. vegetable, number of foods/meals/bites) intakes compared with simple exposure (Ward et al 2015). The included studies were performed more than 14 years ago, so may not be as relevant today. Hendrie et al (2017) found 22 intervention studies that targeted vegetable consumption in children 2-12 years of age. Overall, 12 (out of the 22) interventions were effective in the short-term, and six (out of 10) were effective in the long-term (beyond six months). The mean short-term change in vegetable intake was 29%, which equated to an increase of a quarter to a half of a serving of vegetables (Hendrie et al 2017). When considering the intervention setting, longer term interventions within a pre-school setting were most likely to be effective longer term, with reported increases in children's vegetable intake at six months. Intervention effectiveness was associated with the number of settings targeted and frequency of contact, but not length of the intervention (Hendrie et al 2017).

Effects of repeated exposure and tangible reward (either non-food or social based) were further explored in the school and home environment by Wolfenden et al (2012). Comparison between repeated food exposures coupled with two reward conditions (tangible reward / sticker versus a

social reward / praise) revealed a significantly greater intake of the target vegetable in children that received the exposure plus a tangible non-food reward versus those that received the exposure plus a social reward immediately post intervention, but not at later follow up. The use of rewards to encourage children to eat vegetables requires further investigation as it is unclear whether the effect of increased novel food intake lasts beyond the offer of the reward.

Key references used to inform the evidence statement

Hendrie GA, Lease HJ, Bowen J, et al. 2017. Strategies to Increase Children's Vegetable Intake in Home and Community Settings: A Systematic Review of Literature. *Maternal and Child Nutrition* 13(1): e12276.

Nehring I, Kostka T, von Kries R, et al. 2015. Impacts of in Utero and Early Infant Taste Experiences on Later Taste Acceptance: A Systematic Review. *Journal of Nutrition* 145: 1271-1279.

Ward S, Bélanger M, Donovan D, et al. 2015. Systematic Review of the Relationship between Childcare Educators' Practices and Preschoolers' Physical Activity and Eating Behaviours. *Obesity Reviews* 16(12): 1055-1070.

Hetherington MM, Schwartz C, Madrelle J, et al. 2015. A Step-by-Step Introduction to Vegetables at the Beginning of Complementary Feeding. the Effects of Early and Repeated Exposure. *Appetite* 84: 280-290.

Wolfenden L, Wyse RJ, Britton BI, et al. Interventions for Increasing Fruit and Vegetable Consumption in Children Aged 5 Years and Under. *Cochrane Database of Systematic Reviews* 2012, Issue 11. Art. No.:CD008552. doi:10.1002/14651858.CD008552.pub2.

Howard AJ, Mallan KM, Byrne R, et al. 2012. Toddlers' Food Preferences. The Impact of Novel Food Exposure, Maternal Preferences and Food Neophobia. *Appetite* 59(3): 818-825.

Feeding practices of infants and toddlers in New Zealand

There is little data collected in New Zealand on infant and toddler feeding practices. Qualitative research conducted in 2006 with 12 focus groups, 18 family/whānau groups, 48 in depth interviews with parents and 10 interviews with children, reported some parents believed vegetable eating was a habit best learned while young as a taste for vegetables was harder to acquire in adulthood (Whitfield et al 2007). Participants in this study revealed that vegetables were largely confined to evening meals, and although most people knew vegetables were good for them and should be eaten, many were not clear on exactly why this was so, with some believing fruit consumption could make up for a deficit of vegetables in the diet (Whitfield et al 2007).

A randomised controlled trial in Dunedin between 2009 and 2012 provided information and support to 244 parents of 18-24 month old children about appropriate feeding practices, eating behaviours and healthy food intake, compared with 250 families receiving the standard WellChild Tamariki Ora service (Fangupo et al 2015). As in other similar interventions in Australia, only a limited number of small changes to parental feeding practices were observed. This led Fangupo et al (2015) to conclude that interventions focussing on education and support are not sufficient to modify parent feeding behaviours in early life interventions.

Do coercive food practices (controlling or restricting children’s diet, pressure to eat, punishment and rules) affect child diet and/or body size?

Evidence statement	Parental restriction of a child’s intake (when they appear to eat too much) or pressuring a child to eat (when they appear to eat too little) are counterproductive, as these coercive practices can lead to poor dietary behaviours and increased body weight.	
Grade	A	
Evidence statement	Setting limits on energy-dense foods and drinks in early childhood (up to the age of 10 years) may protect against poor dietary intake and increased body weight. This is best done covertly, by limiting access to, or restricting portion size of, these foods and drinks so that the child is unaware.	
Grade	A	
Component	Rating	Notes
Evidence base	Excellent	Six Level-I SR. 1 additional Level-IV SR focused on fathers. See Appendix 2 Table 2b for details of the studies
Consistency	Good	
Impact	Excellent	
Generalisability	Excellent	
Applicability	Excellent	Many NZ parents do not monitor (note or ask about) their child’s dietary intake, especially outside of home. Families often have food rules which are randomly enforced and sometimes undermined by parents’ behaviours.

Summary of key studies used for the evidence statement

Parents may use a variety of feeding strategies with the intention of modifying their child’s diet and weight gain, but there is evidence that some of these practices may make matters worse. Six systematic reviews since 2007 have reported that restrictive and controlling feeding practices by parents (that is, denying intake, either of overall energy intake or of particular foods and drinks) are associated with increased childhood body mass index (BMI). Most research on feeding practices has only collected information on maternal behaviours but one review has focused on fathers (Fraser et al 2011), also finding that parental control over food is associated with larger body size. This is hypothesised to be due to children being unable to develop self-control and respond to innate satiety cues, and therefore becoming conditioned to eat in the absence of hunger (Shloim et al 2015; Hurley et al 2011; Ventura and Birch 2008; Clark et al 2007; Russell et al 2016; Fraser et al 2011).

However, these associations between restriction and high child BMI are stronger in cross-sectional data, with Shloim et al (2015) cautioning that four longitudinal studies have been equivocal. They point to a high-quality three-year prospective study in Australia (Campbell et al 2010) which found setting limits on energy-dense foods and drinks in early life may reduce obesity risk but that this practice is not as effective with children aged 10-12 years. Campbell et al (2010) comment that ‘overt’ restriction, whereby the child sees the parent consuming the food or beverage or sees the product in the home but the child is not allowed to have it, is different than the ‘covert’ restriction

where the child is unaware that their choices have been limited (e.g the food or beverage is not in the home, or the child is not taken into the shop which sells that product). Studies to date on parental feeding practices have generally measured 'overt' restriction.

Reviews that include longitudinal studies found feeding practices are most likely to be employed as a response to child characteristics (particularly temperament and body size) rather than the other way round. Russell et al (2016) and Bergmeier et al (2014) both report that in several studies where parents were concerned about a child's energy regulation skills, those parents were more likely to implement restrictive feeding strategies. Shloim et al (2015) and Ventura and Birch (Ventura and Birch 2008) reviewed multiple studies which found pressure to eat is often applied by parents in response to children with a lower BMI, who seem to be undereating and/or are 'fussy', and that pressure to eat led to poorer dietary habits across childhood. Some parents in studies have been found to respond with different feeding practices for individual children within their family, taking the child's eating behaviours and characteristics into account.

Bergmeier et al (2014) also state there is a complex bi-directional relationship between maternal perceptions of their child and maternal feeding practices which are evident from infancy and continue through the early childhood years. They state that maternal feeding practices may perpetuate a cycle of reinforcing conditions that lead to poor diet and obesity. Their systematic review which included 13 longitudinal studies argued that child temperament (particularly poor self-regulation and high emotionality), and perhaps personality (difficult to soothe), led to restrictive maternal feeding practices. Children with these 'difficult' temperaments are perceived by their mothers as having poor self-regulation and prone to overconsumption of food, and therefore mothers implement restrictive feeding strategies which reinforce poor-self regulation and over-ride internal satiety cues. Furthermore, chronic stress exacerbates this association, whereby self-regulation (which is in the same predominant brain region as chronic stress) is diminished in both the child and parents, increasing the likelihood of using food to soothe.

As an alternative to coercive practices, Satter (2007) suggests a 'division of responsibility' whereby parents make a variety of foods available at set meal/snack times and then children decide what and how much to eat. In this way, children learn to regulate their own intake, by responding to internal hunger and satiety cues. The emphasis in the Satter approach is on "providing, not depriving" to retain the joy and social aspects of eating. This feeding strategy, although promising, has a limited evidence base to date especially of studies where children's dietary intake and growth have been measured.

Key references used to inform the evidence statement

Russell CG, Taki S, Laws R, 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. *BMC Public Health* 16(1): 1-13.

Shloim N, Edelson LR, Martin N, et al. 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.

Bergmeier H, Skouteris H, Horwood S, et al. 2014. Associations between Child Temperament, Maternal Feeding Practices and Child Body Mass Index during the Preschool Years: A Systematic Review of the Literature. *Obesity Reviews* 15: 9-18.

Hurley KM, Cross MB, Hughes SO. 2011. A Systematic Review of Responsive Feeding and Child Obesity in High-Income Countries. *The Journal of Nutrition* 141(3): 495-501.

Fraser J, Skouteris H, McCabe M, et al. 2011. Paternal Influences on Children's Weight Gain: A Systematic Review. *Fathering*. 9(3): 257-267.

Ventura AK, Birch LL. 2008. Does Parenting Affect Children's Eating and Weight Status? *International Journal of Behavioral Nutrition & Physical Activity* 5(1): 15.

Clark HR, Goyder E, Bissell P, et al. 2007. How do Parents' Child-Feeding Behaviours Influence Child Weight? Implications for Childhood Obesity Policy. *Journal of Public Health* 29(2): 132-141.

Child feeding practices in New Zealand

The 2007 New Zealand Children's Food and Drinks Survey asked parents of 5-16 year olds: 'Not counting the main meals, do you keep a check on what foods and drinks your child has between meals here at home?' and 'Do you ask what foods and drinks your child has when she/he is away from home?' (National Research Bureau 2008). Responses suggest that many New Zealand parents often monitor, i.e. take note of, what their child is eating, particularly parents of younger children when they are home (70%), but 14% of parents never ask, and 11% rarely ask about food eaten out of the home. One in three Māori parents (32%) never or rarely ask about food eaten out of the home, and proportionately more Māori (26%) and Pacific (21%) parents did not monitor snacks at home, compared to Asian (12%) and European/Other (14%) parents. There was little difference in parents responses by neighbourhood deprivation for food eaten outside the home, but a higher proportion of parents living in areas of high deprivation 'never' (12%) or 'rarely' (11%) monitored snacks eaten at home.

Qualitative research conducted in 2006 with 12 focus groups, 18 family/whānau groups, 48 indepth interviews with parents and 10 interviews with children, found parents tended to have a large number of rules in relation to healthy eating, however these rules were far from universal, sometimes randomly enforced, and often undermined by parents' own purchasing and eating habits. Snack rules were less defined than other eating rules, and more open to fluctuation according to the parents' mood and stress levels. This research also reported that some parents believed that there was little need to monitor or limit consumption of sugary or high fat foods unless children were clearly overweight (Whitfield et al 2007).

Haszard used data collected on 1,093 4-8 year olds in the two phases of the MInT (Motivational Interviewing and Treatment) study in Dunedin, to explore the relationship between parental feeding practices, diet quality and weight gain. Haszard found that parents used more restriction and less pressure with girls and with overweight children. Furthermore, healthy eating guidance and monitoring were associated with less dysfunctional parenting practices, more fruits and vegetables, and less sweet drinks. By contrast, child control exhibited inverse associations with these factors (Haszard 2013). Haszard's analysis indicated that restriction, parent pressure and healthy eating guidance, along with maternal BMI, some ethnicities and low maternal education all contributed to a

linear regression model that explained 18% of the variation in BMI z-score (Haszard 2013). She concludes that a better balance is required between the current advice to parents for the prevention and treatment of overweight to allow their children to self-regulate their feeding, and giving the child less child control over what and when they eat, as child control was strongly linked to poorer dietary intake in her research (Haszard 2013).

This study also found that more structure and oversight of the feeding environment by parents was related to fewer problem eating behaviours, particularly fussy eating, and that higher levels of parent pressure (urging the child to eat and/or using food as a reward) were reported by parents of fussy eaters (Haszard et al 2014). Haszard et al (2014) suggest “healthy eating guidance, and in particular, monitoring may have a greater positive effect on the diets of fussy children than non-fussy children or that a lack of these influences has exacerbated or caused fussy eating.”

Does general parenting style or feeding style affect child diet and body size?

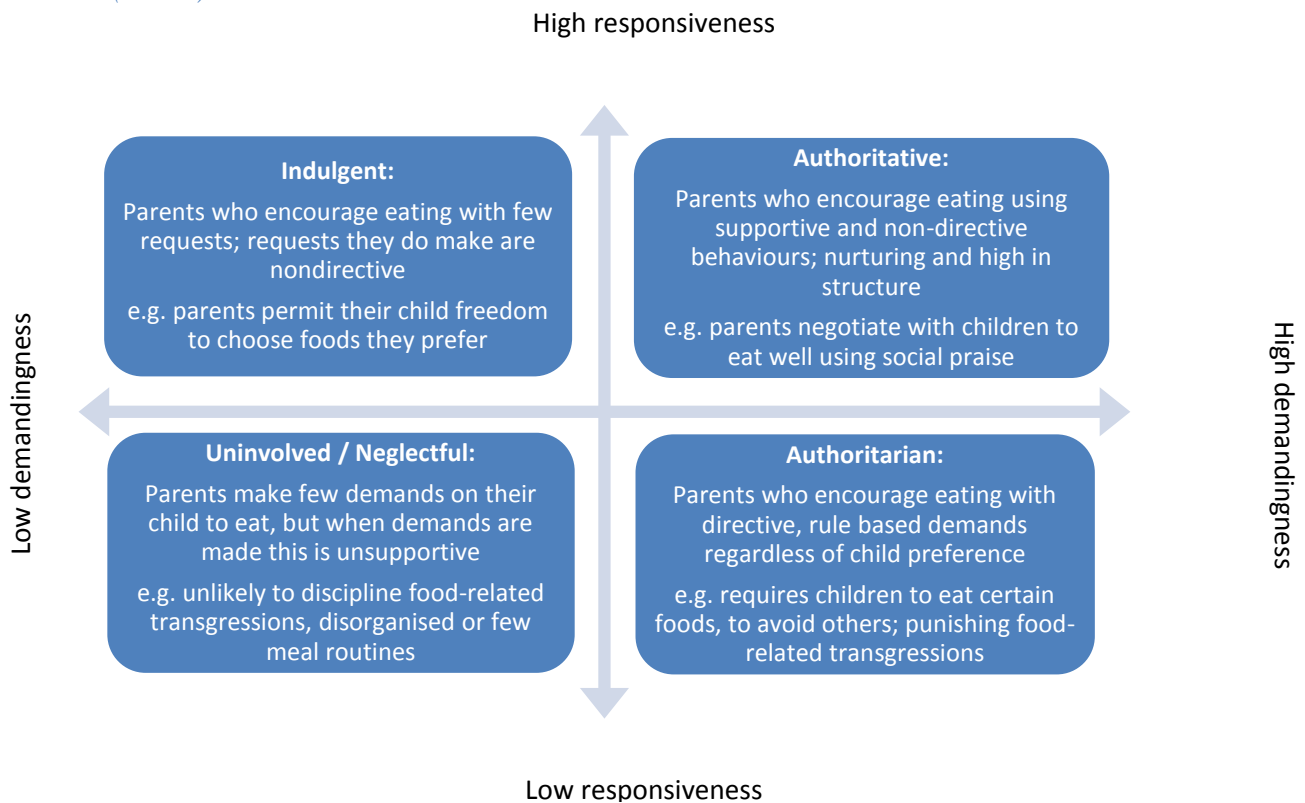
Evidence statement	A nurturing and supportive parenting style helps children to maintain a healthy diet and body size.	
Grade	A	
Evidence statement	Parents should avoid strict food rules, and also, conversely, they should not give children the complete freedom to choose their food.	
Grade	A	
Component	Rating	Notes
Evidence base	Excellent	Four Level-1 SR and two Level-IV SR. 1 additional Level-IV SR on effect of style on behaviours. See Appendix 2 Table 2c for details of the studies.
Consistency	Good	
Impact	Excellent	
Generalisability	Good	Differences in parenting style by socioeconomic status, permissive parenting more prevalent and more strongly linked with poor diet and overweight in high income families.
Applicability	Excellent	One-third of NZ parents authoritative re food; more likely to have permissive style especially regarding snacks outside home.

Summary of key studies used for the evidence statement

Parenting style (also called general parenting) is a description of the collection of attitudes and beliefs parents hold that create an emotional climate between parent and child (Shloim et al 2015). Parenting style usually remains static and is not driven by context or goals, whereas parenting practices are usually specific behavioural strategies or responses to the context or child characteristics. Most general parenting typologies are based on the work of Baumrind (1966) and Maccoby and Martin (1983) who categorise parenting based on the two dimensions of responsiveness (warmth and acceptance in response to children's needs) and demandingness (how much control parents exercise) to create four parenting styles: indulgent, authoritative, uninvolved and authoritarian. This typology was further developed to be specific to feeding style by Hughes et al (2005), outlined in Figure 5.

Parenting style and feeding style are related, but parents do not necessarily apply the same feeding style as their general parenting style (Shloim et al 2015; Vollmer and Mobley 2013). Shloim et al report that when parenting style and feeding style were measured in the same study, feeding style was associated with child BMI but not general parenting style. Likewise, parenting style and feeding style may not automatically be aligned with the parenting food practices which would be expected by a particular feeding style. Sleddens et al (2011) explain that general parenting style mediates the parenting practices employed by parents, but it also moderates the direct association between parenting practices and child health outcomes. One systematic review assessed the effect of general parenting style on feeding practices (Collins et al 2014). Collins et al report that authoritative parenting and higher scores for warmth were associated with parental monitoring of food intake (noticing what their child ate), and the absence of pressure to eat or restriction of food. Authoritarian styles were positively associated with pressuring a child to eat and the adoption of restrictive child feeding behaviours. Permissive parenting was inversely related to monitoring food intake in three studies.

Figure 5: Four major parenting and feeding styles, reproduced from Shloim et al (2015)



Five recent systematic reviews have examined the relationship between general parenting style and child overweight or obesity (Ventura and Birch 2008; Sleddens et al 2011; Vollmer and Mobley 2013; Fraser et al 2011; Shloim et al 2015). Sleddens et al (2011) explained that both low controlling parenting (indulgent) and very strict parenting (authoritarian) are counterproductive, indicating a U-shaped relationship between parental control and child weight. Fraser et al. (2011) found that a similar relationship applies to fathers as well as mothers, drawing largely on the findings of a large longitudinal study which reported a strong association with being overweight or obese if a child's father was permissive (59% increased risk) or disengaged/uninvolved (35% increased risk) compared with an authoritative style. They conclude that warm, supportive and firm parenting, high in structure around mealtimes may protect against preschool overweight and obesity.

Mech et al. (2016) undertook a systematic review of the parent-related mechanisms underlying the socio-economic gradient in childhood overweight and obesity, and concluded that permissive parenting was an issue mainly for children growing up in high income families. High income predicted a greater likelihood of permissive parenting style, and permissive parenting style coupled with long maternal working hours predicted early and sustained childhood overweight. In low socio-economic status families, other factors (such as parent's obesity, high stress and maternal depression) were stronger risk factors for child obesity rather than parenting style.

Key references used to inform the evidence statement

Mech P, Hooley M, Skouteris H, et al. 2016. Parent-Related Mechanisms Underlying the Social Gradient of Childhood Overweight and Obesity: A Systematic Review. *Child: Care, Health and Development* 42(5): 603-624.

Shloim N, Edelson LR, Martin N, et al. 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.

Collins C, Duncanson K, Burrows T. 2014. A Systematic Review Investigating Associations between Parenting Style and Child Feeding Behaviours. *Journal of Human Nutrition and Dietetics* 27: 557-568.

Vollmer R, Mobley AR. 2013. Parenting Styles, Feeding Styles, and their Influence on Child Obesogenic Behaviors and Body Weight. A Review. *Appetite* 71: 232-241.

Fraser J, Skouteris H, McCabe M, et al. 2011. Paternal Influences on Children's Weight Gain: A Systematic Review. *Fathering* 9(3): 257-267.

Sleddens EF, Gerards SM, Thijs C, et al. 2011. General Parenting, Childhood Overweight and Obesity-Inducing Behaviors: A Review. *International Journal of Pediatric Obesity* 6: e12-e27.

Ventura AK, Birch LL. 2008. Does Parenting Affect Children's Eating and Weight Status? *International Journal of Behavioral Nutrition & Physical Activity* 5: 15.

Parenting style in New Zealand

The 2007 New Zealand Children's Food and Drinks Survey asked parents of 5-16 year olds: 'Other than the main meal at home, who chooses what your child eats?' (National Research Bureau 2008). The findings suggest that one in three parents (32%) are following the recommended authoritative feeding style of 'choosing together'. Parents living in areas of low deprivation (41%) and parents of children aged under 12 years (37%) were proportionately more likely to give this response. The indulgent or uninvolved styles reflected by the 'he/she does' answer was the most common style overall among New Zealand parents (37%), and increased with the age of the child (64% of parents of 13-16 year olds provided this response). The authoritarian style when parents choose the food for the child was provided by one quarter of parents (26%), and was higher among Māori (32%) and Pacific parents (36%) (National Research Bureau 2008).

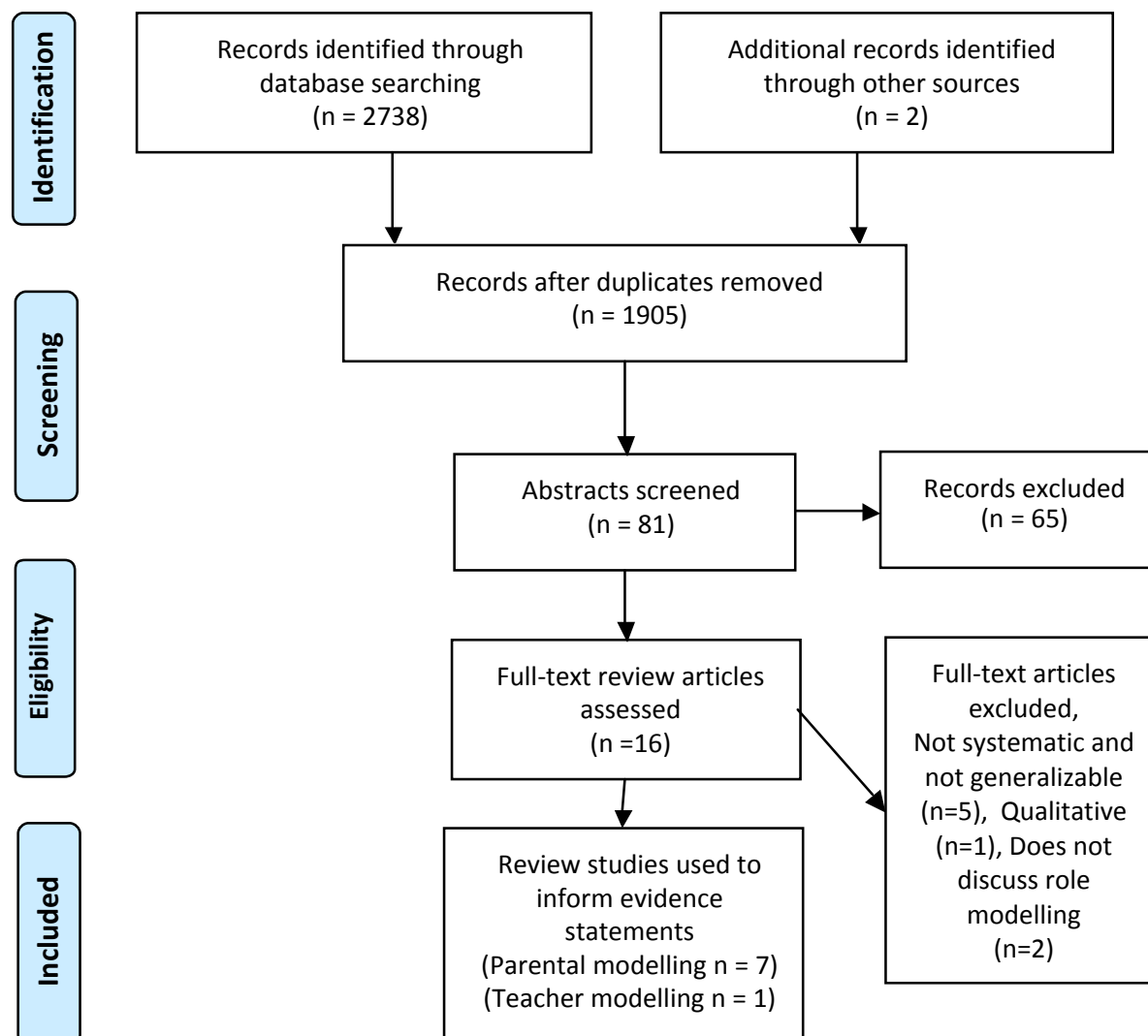
When asked specifically about choosing the child's snacks, a greater proportion of parents (41%) answered 'he/she does' suggesting an indulgent or uninvolved style. Just over one-third of parents (35%) choose the child's snacks with them, and 21% reported that they choose their child's snacks. 67% of children aged 13-16 years chose their own snacks, and parents of younger children were more likely to choose them together with the child (46% of parents of 5-7 year olds and 40% of parents of 8-12 year olds). Parents living in areas of low deprivation (decile 1-3) were more likely to choose with their child and nearly half of parents living in areas of high deprivation (decile 8-10) reported that their child chooses their own snacks (National Research Bureau 2008).

Adult role modelling of healthy eating

Literature search

Figure 6 outlines the literature search process followed to review the evidence about adult (parent, mother, father, teacher, educator, school, early education, preschool) role modelling related to children’s diet and eating behaviours. For the literature search strategy and criteria, and an explanation of the method followed to assess the evidence and develop the evidence statements, see Appendix 1.

Figure 6: Adult role modelling literature search



Does parental role modelling of healthy eating and positive eating behaviours affect child and/or young people’s diet?

Evidence statement	Parental role modelling of fruit and vegetable consumption improves children’s intake of fruit and vegetables.	
Grade	B	
Evidence statement	Young children's sugar-sweetened beverage intake is influenced by parental role modelling.	
Grade	B	
Evidence statement	Adolescents are influenced by parental role modelling of eating breakfast.	
Grade	B	
Component	Rating	Notes
Evidence base	Good	Two Level-I SR and 5 Level-IV SR and two recent Level-II RCTs. See Appendix 2 Table 3a for details of the studies.
Consistency	Good	
Impact	Satisfactory	
Generalisability	Good	
Applicability	Excellent	

Summary of key studies used for the evidence statement

Seven systematic reviews since 2005 have assessed whether parental role-modelling of healthy eating and positive eating behaviours affects child and/or young people’s diet and body size (Pinard et al 2012; Pearson et al 2009; Ventura and Birch 2008; Mazarello Paes et al 2015a; Pearson et al 2008; Zarnowiecki et al 2014; Brown et al 2008). No standardised definition of parental role modelling was used in the included studies, making comparison between reviews difficult. Across all study designs, there was a lack of consistency in defining constructs and the validity of measures. For the most part, parental role modelling was interpreted as positive parental behaviours with a healthy food, or parental consumption of a healthy food, with the intention of influencing the behaviour of the child.

Similarities between parents’ and children’s intakes are apparent cross-sectionally (Brown et al 2008) but Ventura and Birch (2008) also found substantial causal evidence that parent practices affect child eating. Experimental data showed the presence of a peer or adult model acts to facilitate young children’s acceptance of a new food (Ventura and Birch 2008) and cross-sectional evidence found that modelling intake coupled with the availability of healthy foods predicted healthier diets in children over time. Four Level-I reviews considered both prospective cohort studies and cross-section studies (Pearson et al 2009; Ventura and Birch 2008; Mazarello Paes et al 2015b; Brown et al 2008). Two reviews concluded parental breakfast eating was positively associated with adolescent breakfast consumption, but conclusions could not be drawn on the effect of parent modelling in children (Pearson et al 2009; Brown et al 2008). High fruit and vegetable consumption in children was associated with increased maternal modelling in one review, based on the findings of one high quality intervention study (Brown et al 2008). The reviews conclude that parents should be

encouraged to be positive role models to their children and adolescents through targeting their own dietary behaviours as this have been found to be successful.

The determinants of sugar sweetened beverage (SSB) consumption in young children under the age of five years were considered in two reviews (Mazarello Paes et al 2015a; Brown et al 2008). Quantitative evidence supported several determinants of SSB consumption in young children, with the most consistent evidence of a modifiable determinant found for parental modelling. Mazarello et al (2015a) conclude that positive parental modelling should be included as a component of any interventions designed to reduce SSB consumption in young children. A greater reduction in child SSB consumption was seen when maternal consumption of SSB was also targeted (Mazarello Paes et al 2015a).

Two level-IV reviews of cross-sectional studies (Pearson et al 2008; Zarnowiecki et al 2014) found parental role modelling positively influenced child consumption of fruit, fruit juice, vegetables, and all three combined, but had mixed results (both positive and no effect) in adolescents (Pearson et al 2008). Socioeconomic position (SEP) was considered in one level-IV review where parents of low SEP were found to be less likely to model healthy eating behaviours. This relationship is also apparent in the dietary intake of adults of lower SEP. Both reviews made recommendations that future interventions to improve children's diet should encourage parents to be positive role models through targeting parental intakes, healthy eating behaviours, and creating a positive home environment through increased encouragement and availability of fruits and vegetables (Pearson et al 2008; Zarnowiecki et al 2014).

Key references used to inform the evidence statement

Mazarello Paes V, Hesketh K, O'Malley C, et al. 2015. Determinants of Sugar-Sweetened Beverage Consumption in Young Children: A Systematic Review. *Obesity Reviews* 16(11): 903-913.

Zarnowiecki DM, 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.

Pinard CA, Yaroch AL, Hart MH, et al. 2012. Measures of the Home Environment Related to Childhood Obesity: A Systematic Review. *Public Health Nutrition* 15(01): 97.

Ventura AK, Birch LL. 2008. Does Parenting Affect Children's Eating and Weight Status? *International Journal of Behavioral Nutrition & Physical Activity* 5(1): 15.

Pearson N, Biddle SJH, Gorely T. 2009. Family Correlates of Breakfast Consumption among Children and Adolescents. A Systematic Review. *Appetite* 52(1): 1-7.

Pearson N, Biddle SJH, Gorely T. 2008. Family Correlates of Fruit and Vegetable Consumption in Children and Adolescents: A Systematic Review. *Public Health Nutrition* 12(2): 267-283.

Brown R, Scragg R, Quigley R. 2008. Does the Family Environment Contribute to Food Habits Or Behaviours and Physical Activity in Children? Wellington: Agencies for Nutrition Action.

Adult role modelling of healthy eating in New Zealand

Parental role modelling was assessed in the 2007 New Zealand Children's Food and Drinks Survey (National Research Bureau 2008). When asked 'How often do you try to set a good example at home by what you eat and drink?', 55% of parents said that they try all the time, 34% answered fairly often, 6% occasionally, 2% rarely, and 1% never. Clear SES differences were seen, with parents and caregivers living in the most deprived areas more likely to respond that they rarely tried to set good examples at home. Pacific and Māori parents were more likely than other ethnic groups to answer 'fairly often' (38% and 28% respectively). When asked 'what other things could parents/caregivers do to help children eat and drink healthily?', 19% of parents with children aged 5-16 said that they could lead by example/be good role models, with a quarter (26%) of parents of 5-7 year olds identifying this as a good strategy to improve children's nutrition.

In the 2012 Healthy Lifestyles Survey (HPA Research and Evaluation Unit 2014) children whose parents or caregivers ate breakfast every day were more likely to do the same compared with children whose parental figures do not eat breakfast every day (OR=1.99, 1.11-3.59). Higher parental education level was associated with high rates of breakfast eating for both parents/caregivers and children (HPA Research and Evaluation Unit 2014).

Qualitative research conducted in 2006 with 12 focus groups, 18 family/whānau groups, 48 indepth interviews with parents and 10 interviews with children about healthy eating found children's eating habits generally reflected those of their parents (Whitfield et al 2007). Most parents in this study desired to be good eating role models which sometimes led to double standards or surreptitious eating. Some parents hid or downplayed their liking for sweet and high fat foods and fizzy drink in order to be good role models, and other parents made these items freely available because they wanted to consume them too. Fruit and vegetable consumption were key examples given where parents say one thing to their children and do the opposite themselves. Some parents acknowledged they were poor role models when it came to eating vegetables and felt this undermined attempts to persuade children to eat them (Whitfield et al 2007).

The MInT study in Dunedin trialling a family-based treatment approach to childhood overweight collected data on 1093 overweight children aged 4-8 years (Haszard 2013). Included in the study were questions measuring 'healthy eating guidance' by parents which included aspects of modelling, teaching about nutrition, environment (food availability) and encouraging balance and variety. This construct represented a positive, guiding attitude to healthy eating by the parent. Haszard's research showed that healthy eating guidance was linked to healthier dietary intake patterns and lower levels of obesity in the MInT samples. It was associated with increased fruit and vegetable consumption in both samples and was significantly correlated with lower sweet drink intake and lower non-core food intake. Healthy eating guidance was robustly associated with lower BMI z-scores and was reported at significantly lower levels in obese children compared with normal weight children. In her thesis, Haszard recommends that New Zealand parents be instructed to:

- Eat healthy foods in front of your child often, and tell your child that they taste good
- Show enjoyment of and enthusiasm for eating healthy foods to your child
- Discuss with your child why healthy foods are good for them
- Encourage your child to eat a variety of foods and to try new things
- Have fruits and vegetables available in your home
- Reduce the amount of [energy-dense, nutrient poor] foods in the home (Haszard 2013).

Does teacher role-modelling of healthy eating and positive eating behaviours affect child diet?

Evidence statement	Early childhood teacher practices, particularly enthusiastic, positive role-modelling of healthy eating during mealtimes, may influence preschoolers' eating behaviours.	
Grade	C	
Component	Rating	Notes
Evidence base	Satisfactory	One Level-I SR. See Appendix 2 Table 3b for details of the studies used to inform this evidence statement
Consistency	Satisfactory	
Impact	Good	Most studies included are in US with African American, Latino and Hispanic children
Generalisability	Satisfactory	
Applicability	Good	

Summary of key studies used for the evidence statement

One systematic review since 2005 has assessed the effect of teacher role modelling (both silent and enthusiastic) of healthy eating and positive eating behaviours on child and/or young people's diet and body size (Ward et al 2015). Three of the five studies included were RCTs or quasi-experimental trials that were of low (n=1) and moderate (n=2) quality. The other two included studies were low quality pre-post studies, both of which showed consistent results with the RCTs. All five papers reported positive changes in children's eating behaviours when educators used recommended mealtime practices. One small moderate quality quasi-experimental study found that silent modelling was not effective in increasing children's intakes. The other quasi-experimental study saw children's intake and acceptance of food increase when educators modelled healthy eating enthusiastically. This effect was no longer observed when adjusted for peer modelling. Findings from this single systematic review indicate that educator practices may play a role in positively influencing pre-school eating behaviours, but this evidence is weak due to the lack of intervention studies on this topic (Ward et al 2015). There were no systematic reviews on the influence of primary or secondary school teacher role-modelling on child diet or body size.

Key reference used to inform the evidence statement

Ward S, Bélanger M, Donovan D, et al. 2015. Systematic Review of the Relationship between Childcare Educators' Practices and Preschoolers' Physical Activity and Eating Behaviours. *Obesity Reviews* 16(12): 1055-1070.

Teacher role modelling of healthy eating in New Zealand

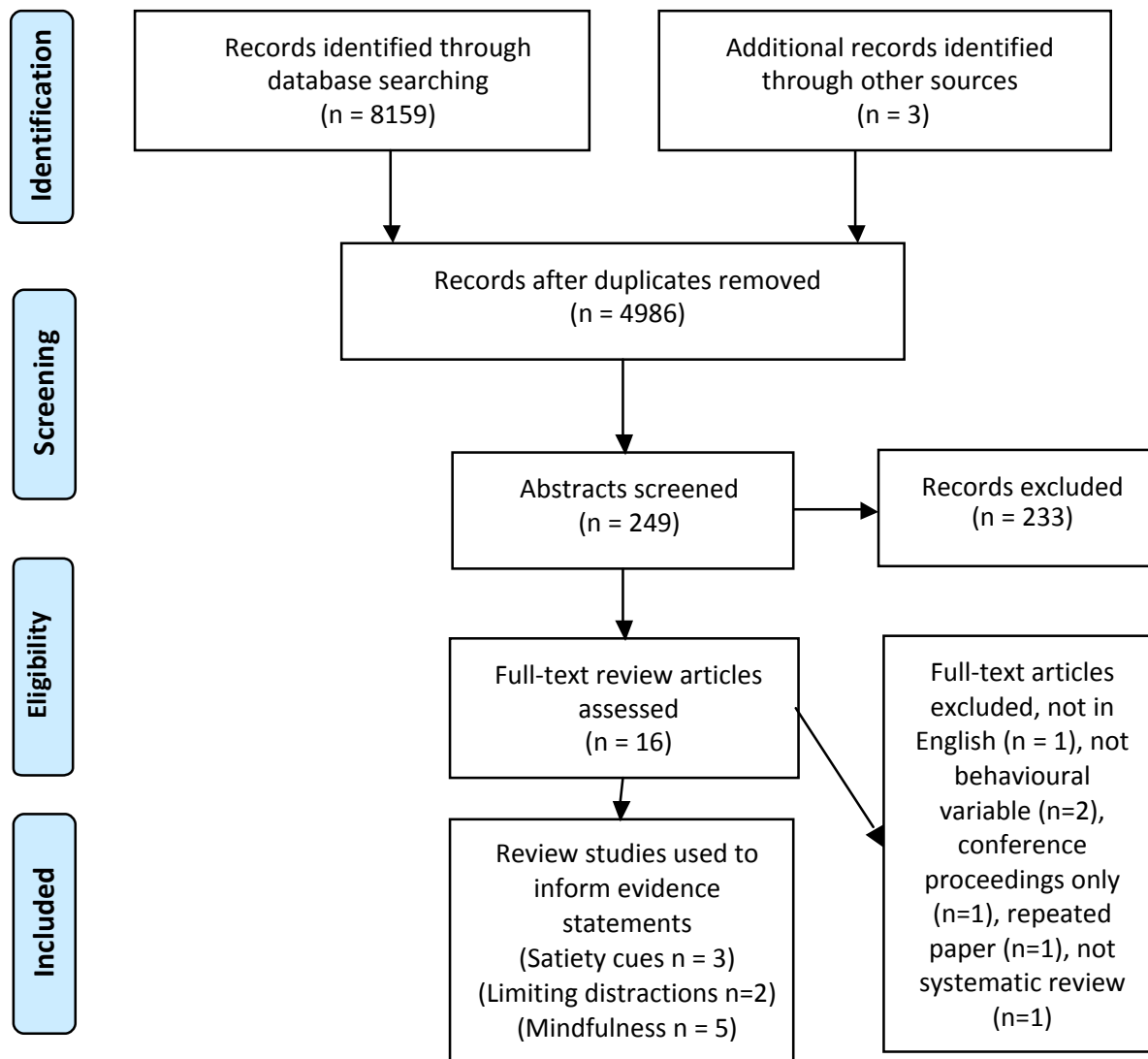
Identification of practices that promote healthy eating in the pre-school setting were investigated in a survey of 257 early learning services in Auckland and the Waikato in 2014 (Gerritsen et al 2015). In this survey, 80% of services reported that teaching staff always sit with children while they ate, and the same proportion actively encouraged and promoted water consumption. However, only a quarter (26.5%) of ECE services reported that teachers eat or drink the same foods as children which would give them the opportunity to role model healthy eating enthusiastically.

Responsive eating

Literature search

Figure 7 outlines the literature search process followed to review the evidence about responsive eating behaviours, including parental recognition of hunger and satiety cues in children (infants, toddlers, babies, preschool, young children), limiting distractions while eating (watching television, screens, computer, laptops, mobiles, phone) and non-diet approaches to eating (mindfulness, intuitive eating). For the literature search strategy and criteria, and an explanation of the method followed to assess the evidence and develop the evidence statements, see Appendix 1.

Figure 7: Responsiveness literature search



Does responsive feeding of infants and young children affect dietary intake and/or body size?

Evidence statement	Parental awareness and recognition of hunger and satiety cues can lead to small improvements in infant and toddler diet, food preferences and eating behaviours, and may be protective against excessive weight gain.	
Grade	B	
Component	Rating	Notes
Evidence base	Good	Two Level-I SR relevant to infants and toddlers and 1 Level-II RCT. See Appendix 2 Table 4a for details of the studies used to inform this evidence statement
Consistency	Good	
Impact	Excellent	
Generalisability	Good	Largely research conducted in the US
Applicability	Unclear	Unclear how many parents in NZ follow a responsive infant feeding approach, but a small study in Māori, Pacific and low-income mothers suggest that more advice on this is needed.

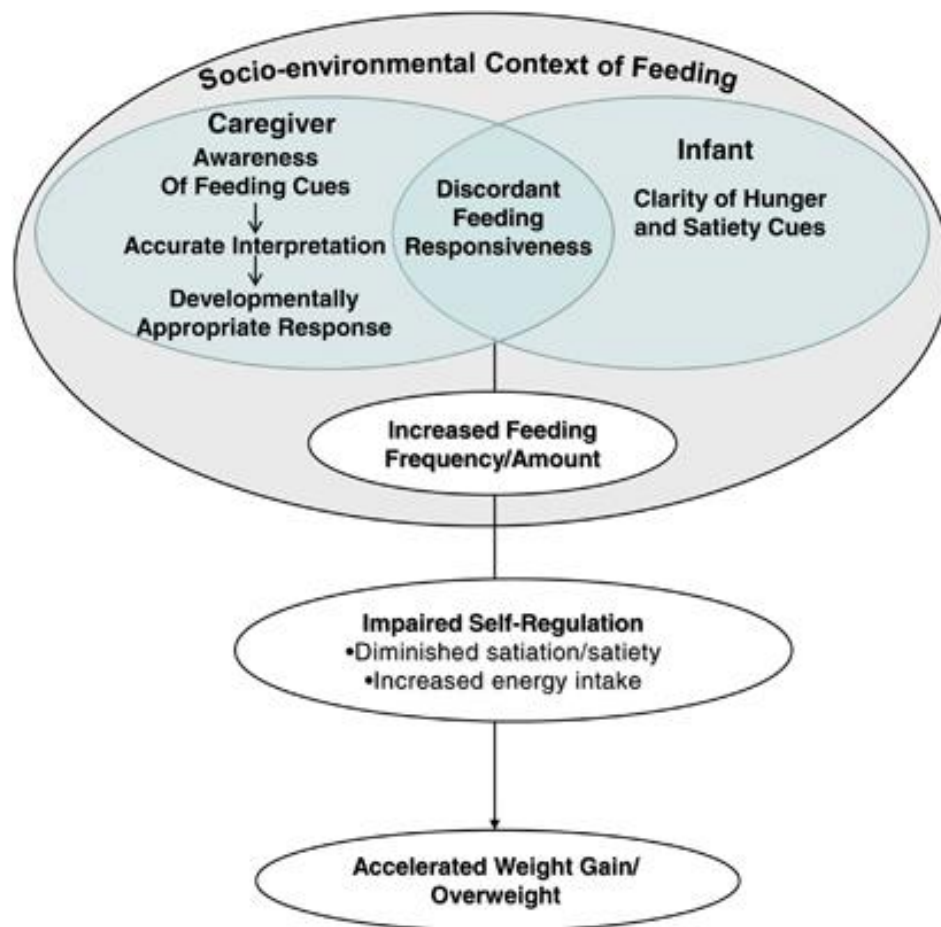
Summary of key studies used for the evidence statement

There are many factors in early life that influence long-term food behaviours. Although the role of the family in the development of children's food behaviours and acceptance is well recognised, most interventions to prevent childhood overweight and obesity have focused on advice regarding early feeding patterns and dietary intake. The development of a child's response to internal hunger and satiety cues during feeding may also be important for the development of self-regulatory abilities around appetite. Currently, there is significant interest in the role of responsive feeding (as characterised by the caregiver's guidance and recognition of the child's cues of hunger and satiety) in determining the risk of childhood overweight and obesity. Responsive feeding may be one of the most important practices in encouraging healthy eating behaviours in early life (Cameron, 2012).

A systematic review by Hurley et al (2011) identified 31 studies which examined the association between responsive feeding and child weight status. Most of the studies were conducted in the US and were cross-sectional. Findings relating feeding to child weight/growth were reported by age group (infancy/toddlerhood, toddler/preschool, preschool/elementary). The most frequent finding (16/31) across the three age ranges was an association with parental feeding control and child weight gain/ status. Restriction of food intake was related to higher BMI and/or overweight and pressure during feeding was related to lower BMI/weight gain. There was a positive relationship between indulgent feeding behaviour and BMI and/or overweight and a negative association between indulgent feeding and children's intake of fruits and vegetables (Hurley et al 2011). Refer also to the coercive feeding practices section under the 'Parenting' chapter in this report.

DiSantis et al (2011) in Figure 8 represent the pathway from discordant feeding to accelerated weight gain. The model suggest that a chronic mismatch between the caregivers responsiveness and the infants feeding may eventually lead to inappropriate weight gain and impaired infant self-regulation.

Figure 8: Conceptual model of pathway from caregiver's responsiveness to infant feeding cues leading to accelerated weight gain and overweight via impaired infant self-regulation, reproduced from DiSantis (2011)



The systematic review by DiSantis et al (2011) examined the association between responsive feeding and overweight during infancy and toddlerhood. Most of the studies were conducted in the US and five out of nine were prospective cohort studies (two of the studies were included in the systematic review by Hurley et al. (2011) . Of the nine studies reviewed, three revealed associations with dimensions of feeding responsiveness as defined by the proposed model (Figure 8), but only one of these studies assessed feeding interactions in a longitudinal manner which DiSantis et al. deemed necessary to truly assess the dynamic nature of caregiver-infant feeding interactions and their impact on obesity outcomes.

Magarey et al (2016) evaluated the dietary intake impact outcomes at 3.5 years after the NOURISH early feeding intervention. NOURISH was a randomised controlled trial evaluating an early feeding intervention targeting first-time mothers of healthy term infants. This included anticipatory guidance which is a proactive and preventative approach to provide parents with information about behaviours they can expect and positive ways to manage these, rather than waiting until parents seek advice once problems have become established. The anticipatory guidance in this case was the promotion of complimentary feeding practices which were hypothesised to improve dietary outcomes and reduce obesity risk. Mothers allocated to the intervention consistently reported using

more protective feeding practices than those receiving usual care. There was no overall significant intervention effect on anthropometric indicators of obesity risk. However at follow up assessments (2, 3.7 and 5 years) the BMI Z-scores of intervention children were 16-17% lower than control children. At 3.5 years post-intervention the group receiving anticipatory guidance regarding positive feeding practices showed small improvements in child dietary score, food preferences and eating behaviours but not in overall dietary intake.

A systematic review of Baby Led Weaning (where the infant feeds themselves hand-held foods instead of being spoon-fed by an adult from the very start of the weaning period), suggests that this approach may lead to a greater acceptance of foods with a variety of textures and subsequently higher intakes of foods such as vegetables and unprocessed foods (Cameron et al 2012). Baby Led Weaning is considered to be a more responsive way of feeding, assisting the development of self-regulation within children. A randomised controlled trial on the effect of a modified Baby-led Weaning approach has been conducted in New Zealand, addressing concerns about inadequate iron and energy intake that may occur with the use of traditional Baby Led Weaning (Cameron et al 2015). This method, called 'Baby Led Introduction to SolidS (BLISS)' was successfully piloted with results showing a reduction in the offering of high-choking-risk foods and the offerings and variety of iron-containing foods. Findings from the larger randomised controlled trial are yet to be published (Cameron et al 2015).

Key references used to inform the evidence statement

Magarey A, Mauch C, Mallan K, et al. 2016. Child Dietary and Eating Behavior Outcomes Up to 3.5 Years After an Early Feeding Intervention: The NOURISH RCT. *Obesity* 24: 1537-1545.

Cameron SL, Taylor RW, Heath AM. 2015. Development and Pilot Testing of Baby-Led Introduction to SolidS - a Version of Baby-Led Weaning Modified to Address Concerns about Iron Deficiency, Growth Faltering and Choking. *BMC Pediatrics* 15(1): 99.

Cameron LS, Heath MA, Taylor WR. 2012. How Feasible is Baby-Led Weaning as an Approach to Infant Feeding? A Review of the Evidence. *Nutrients* 4(11): 1575-1609.

Hurley KM, Cross MB, Hughes SO. 2011. A Systematic Review of Responsive Feeding and Child Obesity in High-Income Countries. *The Journal of Nutrition* 141(3): 495-501.

Disantis KI, Hodges EA, Johnson SL, et al. 2011. The Role of Responsive Feeding in Overweight during Infancy and Toddlerhood: A Systematic Review. *International Journal of Obesity* 35(4): 480-492.

Recognition of satiety cues by parents with infants and young children in New Zealand

Qualitative research commissioned by the Health Promotion Agency in 2014 explored the ability of first-time New Zealand mothers to recognise their infant's hunger and satiety cues during feeding (Research New Zealand Ltd 2014). Six focus groups with first-time Māori, Pacific, and low-income mothers of infants aged six to 23 months, found these mothers had limited prior knowledge and awareness of the responsive feeding approach and most had adopted a more controlled/structured approach to feeding. The report concluded that mothers are prevented from being truly responsive due to a lack of confidence in reading their baby's hunger and satiety cues alongside their desire to

establish a routine as soon as possible. In order to increase receptiveness to a responsive feeding approach, efforts need to be directed at providing evidence that the approach is an effective option; clearly illustrating the benefits; and providing a consistent message through a range of relevant sources containing information and advice on how to interpret hunger and satiety cues (Research New Zealand Ltd 2014).

Does limiting distractions while eating improve diet and/or body size?

Evidence statement	Watching TV while eating increases food intake in children, adolescents and adults, even in the absence of food advertisements. This effect may also be present with other screens (e.g. computers, phones).	
Grade	A	
Component	Rating	Notes
Evidence base	Good	Two Level-I SR. See Appendix 2 Table 4b for details of the studies used to inform this evidence statement
Consistency	Excellent	
Impact	Excellent	
Generalisability	Good	
Applicability	Excellent	Eating in front of the television is a common behaviour in New Zealand families

Summary of key studies used for the evidence statement

There are several theories in the literature about why eating while watching television (and possibly the use of other screens as well) negatively impacts on diet and body size. Television watching while eating is thought to interrupt the physiologic signals of satiety and satiation, so people find it difficult to know when they are hungry or full. Alternatively, television may serve as a conditioned cue to eat (a learned behaviour) or impair memory of foods already consumed, which can lead to overeating (Marsh et al 2013).

A systematic review by Marsh et al (2013) examined the evidence from laboratory based studies which have investigated the non-advertising effects of screen time (TV viewing, sedentary video games and computer use) on dietary intake in children and adolescence and young adults. Ten studies were included in the review including eight RCTs. All studies were conducted in high income countries including France, Denmark, USA, Canada and Australia. Screen time (even in the absence of food advertising) was consistently found to be associated with increased dietary intake compared with non-screen behaviours. Marsh et al (2013) concluded that children appear to be at greater risk than adolescents and young adults to the non-advertising effects of screen time, and overweight and obese children are at greater risk of the negative effects of screen-based activities on energy intake.

A systematic review and meta-analysis by (Chapman et al 2012) examined the relationship between three lifestyle choices and increases in acute food intake in adults. Twenty-three, studies were included in the meta-analysis. The inclusion criteria were studies which only took place in controlled laboratory settings with healthy individuals. Three meta-analyses were performed; one for each lifestyle factor of sleep deprivation, television watching and alcohol consumption. A random effect model was used to allow for the heterogeneity of the studies included. Television watching, alcohol intake and sleep deprivation had a significant short-term effect on increasing food intake with alcohol having the most significant effect. The authors conclude that alcohol and TV viewing impair prefrontal and executive function respectively and that these behaviours increase food intake in the short term.

Key references used to inform the evidence statement

Marsh S, Ni Mhurchu C, Maddison R. 2013. The Non-Advertising Effects of Screen-Based Sedentary Activities on Acute Eating Behaviours in Children, Adolescents, and Young Adults. A Systematic Review. *Appetite* 71: 259-273.

Chapman CD, Benedict C, Brooks SJ, et al. 2012. Lifestyle Determinants of the Drive to Eat: A Meta-Analysis. *The American Journal of Clinical Nutrition* 96(3): 492-497.

Limiting distractions while eating in New Zealand

The 2007 New Zealand Children's Food and Drinks Survey reported that over half (53%) of parents said their child sometimes had his/her meal in front of the television, computer or PlayStation. Of those parents who said that this happened, 26% said that it happened every day (which equates to 14% of all children aged 5 to 16 years old eating in front of the television, computer or PlayStation every day). Parents reporting about their 13-16 year olds were more likely to say their child ate in front of the television, computer or Playstation than parents of younger children (63% compared with 45-50% respectively). There was little variation in the responses to this question by neighbourhood deprivation, although parents of European/Other ethnicity were more likely to report their child ate in front of the television or computer than parents of Māori ethnicity (56% compared with 43% respectively).

TNS Research conducted 12 focus groups, 18 family/whānau groups, 48 indepth interviews with parents and 10 interviews with children in 2006 about healthy eating for the Health Sponsorship Council (Whitfield et al 2007). The authors concluded that eating in front of television had replaced evening meals at the table for many families/whānau in New Zealand (Whitfield et al 2007).

Do responsive eating techniques affect adult diet and/or body size?

Evidence statement	Being mindful and paying attention to food while eating, then stopping eating when feeling full, helps to regulate eating patterns and improve unhealthy weight control behaviours in adults. It is unclear if these techniques have an effect on weight loss and weight maintenance.	
Grade	B	
Component	Rating	Notes
Evidence base	Excellent	See Appendix 2 Table 4c for details of the studies used to inform this evidence statement
Consistency	Good	
Impact	Good	
Generalisability	Excellent	
Applicability	Good	At least for NZ women. Unknown in men.

Summary of key studies used for the evidence statement

Dieting and weight loss maintenance has become normative behaviour among many people. Food restriction, using fad diets, skipping meals or eliminating forbidden foods for the purpose of weight loss is common. Regardless of the method employed, “dieting” often results in short term weight loss but invariably this weight is regained over time (Barte et al 2010). Psychological stress is another contributor to weight gain, and is sometimes the outcome of the failure of weight loss strategies (Groesz et al 2012; Sominsky and Spencer 2014). Many people report overeating or eating unhealthy foods in response to stress (Habhab et al 2009). An alternative approach therefore to weight loss and to aide weight maintenance is the use of non-diet approaches. Non-diet approaches to weight loss include: mindfulness, intuitive eating (eating by internal cues), and attentive approaches.

Mindfulness and intuitive eating encompass similar paradigms. They shift the focus away from body weight and “diets” to change in health behaviours and improvement of psychological well-being. Mindfulness techniques are centred on exercises that bring about a willingness to experience difficult thoughts, feelings and sensations rather than trying to control them. Attentive eating is a cognitive strategy which is also used in mindfulness eating. Attentive eating gives attention to food while it is being eaten and purposefully using memories of previously eaten food. Both techniques may include eating slowly and without distraction, but place more emphasis on intention (eating with the intention of caring for yourself) and attention (noticing and enjoying food, recognising the effect foods have on the body, and recognising satiety).

Five recent systematic reviews have examined the role of non-diet approaches to eating and their effect on food intake and/or weight loss (Daubenmier et al 2016; Schaefer and Magnuson 2014; Katterman et al 2014; Clifford et al 2015; Robinson et al 2013). Comparison of the outcomes of the reviews is complex as each review considered studies which used different definitions for non-diet approaches and different assessment instruments for measuring outcomes. For example the review by Schaeffer and Magnuson (2014) considers intervention studies that promote internal cues – but many of the studies in this review use combined non-diet approaches including mindfulness.

The outcomes from the systematic reviews and the most recent randomised controlled trial by Daubenmier et al (2016) suggest that non-diet approaches appear to help participants with disordered eating patterns and assist with improving unhealthy weight control behaviours, but the effect on weight loss and weight maintenance is equivocal at present.

Key references used to inform the evidence statement

Daubenmier J, Moran PJ, Kristeller J, et al. 2016. Effects of a Mindfulness-Based Weight Loss Intervention in Adults with Obesity: A Randomized Clinical Trial. *Obesity* 24(4): 794-804.

Clifford D, Ozier A, Bundros J, et al. 2015. Impact of Non-Diet Approaches on Attitudes, Behaviors, and Health Outcomes: A Systematic Review. *Journal of Nutrition Education and Behavior* 47(2): 143-155.

Schaefer JT, Magnuson AB. 2014. A Review of Interventions that Promote Eating by Internal Cues. *Journal of the Academy of Nutrition & Dietetics* 114(5): 734-760.

Katterman SN, Kleinman BM, Hood MM, et al. 2014. Mindfulness Meditation as an Intervention for Binge Eating, Emotional Eating, and Weight Loss: A Systematic Review. *Eating Behaviors* 15(2): 197-204.

Robinson E, Higgs S, Daley A, et al. 2013. Attentive Eating: A Novel Approach to Weight Loss. *Obesity Facts* 6: 23.

Responsive eating and mindfulness when eating in New Zealand

It is not clear how widespread the use of responsive eating techniques are among the total New Zealand adult population. However, a New Zealand study by Madden et al (2012) examined the association between eating in response to hunger and satiety signals (intuitive eating) and BMI in 1601 middle-aged women. This cross-sectional study used a nationally representative sampling frame to recruit women aged 40 to 50 years who completed the intuitive eating scale questionnaire (IES). IES scores were significantly associated with BMI in an inverse direction, that is, women who eat in response to hunger and satiety cues had a lower BMI than women who eat in response to emotional and situational influences. Madden et al (2012) noted that it would only cause a small increase in intuitive eating (half of the 21 items in their IES questionnaire would require a 1 point increase in a 5 point Likert scale) to see a reduction of 4.4kg in a woman typical in their sample, which they describe as a realistic, achievable and practical improvement given that women of this age in New Zealand are mostly overweight or obese.

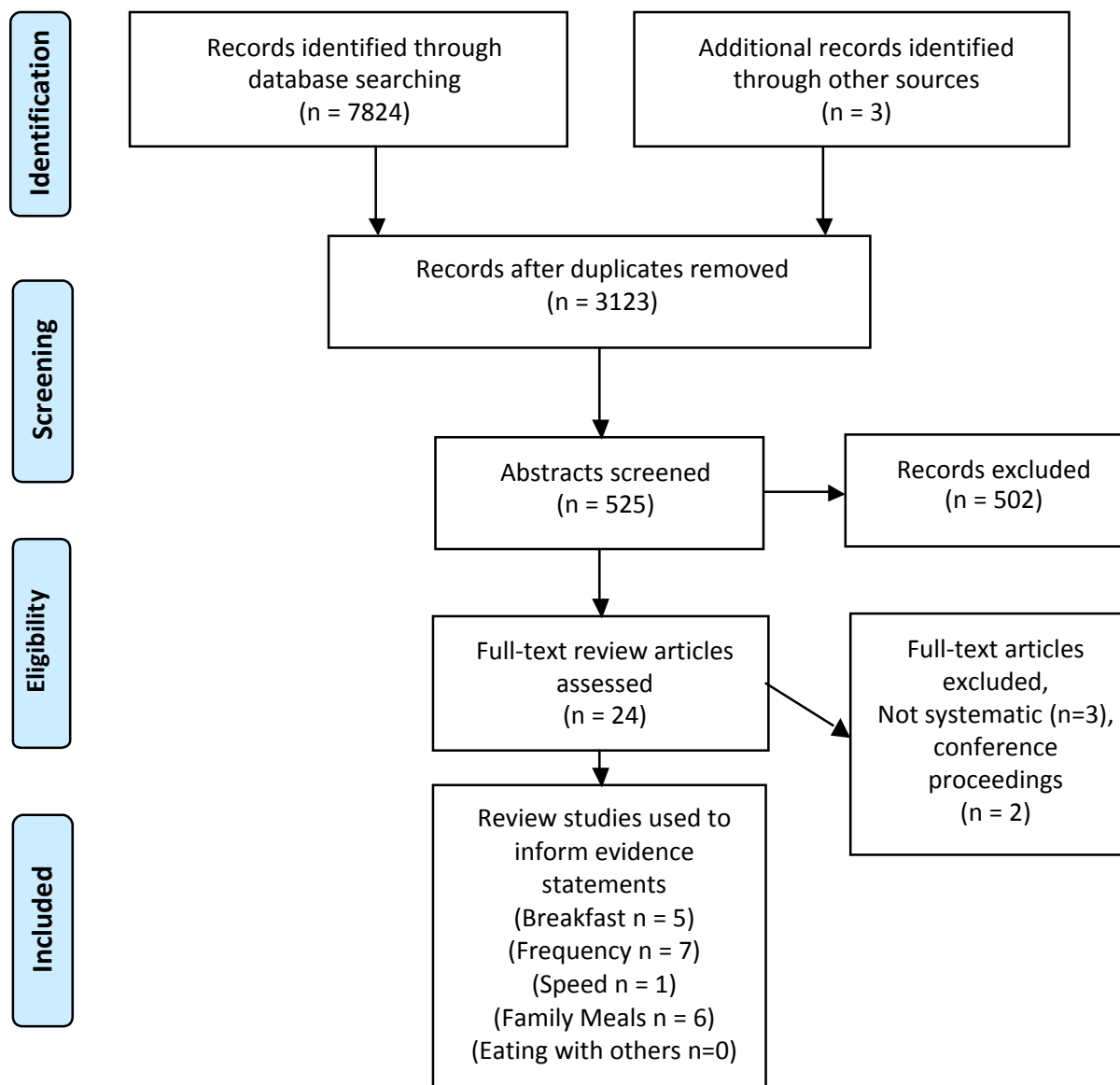
Another NZ study, by Paterson et al (2016), used a qualitative approach to examine women's experiences of eating in pregnancy in the context of intuitive eating. Using the same IES questionnaire as the study by Madden (2012) and employing a cognitive "think-aloud" process, the researchers derived themes using an inductive approach. The findings of the study indicated that changes in eating were driven by a variety of reasons which differed between women and pregnancies.

Mealtimes

Literature search

Figure 9 outlines the literature search process followed to review the evidence about mealtime behaviours, including skipping or eating breakfast, the frequency and speed of eating (timing, duration, eating quickly, snacking, meal routine, pattern) and eating with others (together, family mealtimes, communal dining). For the literature search strategy and criteria, and an explanation of the method followed to assess the evidence and develop the evidence statements, see Appendix 1.

Figure 9: Mealtimes literature search



Does eating or skipping breakfast affect diet and/or body size?

Evidence statement	Eating a healthy breakfast daily (at all ages) appears to improve diet quality overall and may protect against weight gain, but is not associated with weight loss.	
Grade	B	
Evidence statement	Eating a healthy breakfast daily in childhood can lead to improvements in academic performance.	
Grade	A	
Component	Rating	Notes
Evidence base	Good	Three Level-I SR about body size. One Level-I SR about diet quality. See Appendix 2 Table 5a for details of the studies used to inform this evidence statement.
Consistency	Good	Unclear effect in longitudinal studies and short interventions
Impact	Good	
Generalisability	Good	Most longitudinal studies in children were from the USA
Applicability	Good	High breakfast consumption among young children and adults, but lower among adolescents and families living in areas of high deprivation.

Summary of key studies used for the evidence statement

Five systematic reviews since 2005 have assessed the effect of breakfast consumption on body size (see key references below), drawing on a large body of research. Three of the reviews included meta-analyses of cross-sectional data (Brown et al 2013; Horikawa et al 2011; Szajewska and Ruszczyński 2010) finding a clear statistically significant association between skipping breakfast and gaining excess weight in children. However, cross-sectional associations do not imply causation. Brown et al (2013) cite some examples where researchers have used causal language to describe their cross-sectional findings, a phenomenon they call the ‘presumed effect of breakfast on obesity’, which has led to a widely-held view that skipping breakfast is detrimental to weight loss.

The three Level-I reviews that included randomised controlled trials or prospective cohort studies found inconsistent results, often depending on which definition of breakfast was used, if participants were overweight at baseline, and if there were adjustments for multiple potential confounding factors (Mesas et al 2012; Brown et al 2013; Quigley et al 2007). Breakfast consumption tends to cluster with other healthy food behaviours (e.g. increased fibre and vegetable intake, not smoking, physical activity) and taking these factors into account in a research study can be difficult. Two prospective studies found that eating breakfast protects against weight gain, but the subjects were healthy young men in both studies (Mesas et al 2012). In adolescents, a large prospective study found that normal-weight teens who skipped breakfast had an increase in BMI over time, whereas overweight breakfast skippers *lowered* their BMI overtime compared with breakfast eaters.

One systematic review and two other reviews considered the effect of breakfast on energy, micronutrient and macronutrient intake (Rampersaud et al 2005; Timlin and Pereira 2007; Quigley et al 2007), all concluding that breakfast eaters tend to have a better overall diet, consuming more vitamins and minerals, whole grains, fortified cereals, protein, fibre and fresh fruit, and lower total

fat than breakfast skippers. These findings are consistent in both adults and children, despite possibly higher daily energy intakes in breakfast eaters.

Additionally, Quigley et al (2007) detail convincing evidence (five observational, four cohort, one out of three short-term trials, and three long-term interventions, two of which were randomised) that consuming breakfast in childhood is associated with improvements in academic performance. This finding alone warrants public health support for eating breakfast in childhood.

Key references used to inform the evidence statement

Brown AW, Bohan Brown MM, Allison DB. 2013. Belief Beyond the Evidence: Using the Proposed Effect of Breakfast on Obesity to Show Two Practices that Distort Scientific Evidence. *American Journal of Clinical Nutrition* 98(5): 1298-1308.

Mesas AE, Munoz-Pareja M, Lopez-Garcia E, et al. 2012. Selected Eating Behaviours and Excess Body Weight: A Systematic Review. *Obesity Reviews* 13(2): 106-135.

Horikawa C, Kodama S, Yachi Y, et al. 2011. Skipping Breakfast and Prevalence of Overweight and Obesity in Asian and Pacific Regions: A Meta-Analysis. *Preventive Medicine* 53(4): 260-267.

Szajewska H, Ruszczyński M. 2010. Systematic Review Demonstrating that Breakfast Consumption Influences Body Weight Outcomes in Children and Adolescents in Europe. *Critical Reviews in Food Science and Nutrition* 50(2): 113-119.

Quigley R, Taylor R, Scragg R. 2007. *Is Consuming Breakfast Important for Academic Performance, Maintaining a Healthy Body Weight, and Improving Nutrient Intake and Lifestyle Habits in Children?* Wellington: Scientific Committee of Agencies for Nutrition Action.

Eating breakfast in New Zealand

The 2014/15 New Zealand Health Survey found 87% of children aged 2-14 years had eaten breakfast at home every day in the previous week (Ministry of Health 2015a). Previous New Zealand Health Surveys and the 2002 Children's Nutrition Survey (CNS) have found similar breakfast consumption figures suggesting that there has been no change over time in this behaviour (Parnell et al 2003). The beneficial dietary effects of eating breakfast were found to be consistent across ethnic groups in the 2002 CNS (Wilson et al 2006a). Children who skipped breakfast were also more likely to skip lunch and to buy food from the dairy or school canteen, and were less likely to bring food from home to school, after adjustment for demographic variables using the same CNS data (Utter et al 2007).

Older children were less likely than younger children to eat breakfast at home every day: 78% of 10-14 year olds compared with 93% of 2-4 year olds in the 2014/15 New Zealand Health Survey (Ministry of Health 2015a) and 72% of 14-16 year olds compared with 93% of 5-7 year olds in the 2012 Health and Lifestyle Behaviours Survey (HPA Research and Evaluation Unit 2014), with similar findings in the 2007 New Zealand Children's Food and Drinks Survey (National Research Bureau 2008).

Children living in the most deprived areas (NZDep2013 quintile 5) were three times more likely than children in the least deprived areas (NZDep2013 quintile 1) to have eaten breakfast less than 5 days

in the past week in the 2014/15 New Zealand Health Survey, adjusting for age, sex and ethnic group differences (Ministry of Health 2015a). The 2007 New Zealand Children's Food and Drinks Survey reported that 71% of school-aged children living in areas of high deprivation (decile 8-10 on the NZ Deprivation Index) ate breakfast every day at home on school days, compared to 94% of children living in areas of low deprivation (decile 1-3). 11% of school children living in areas of high deprivation never ate breakfast at home on school days (National Research Bureau 2008).

Māori children were two times more likely than non-Māori, and Pacific children 2.5 times more likely than non-Pacific, to have eaten breakfast less than 5 days in the past week (Ministry of Health 2015a). However, in a different national survey of school-aged children, the differences by ethnic group in children's breakfast consumption disappeared once the data was controlled for parental education level (HPA Research and Evaluation Unit 2014).

The most recent data collected on adult breakfast consumption was the 2008/09 Adult Nutrition Survey. This survey found breakfast was eaten daily by 67% of the total population aged 15 years and over, and a further 19% ate breakfast three to six times a week. Six percent did not usually eat breakfast. Overall, the proportion of both males and females who reported eating breakfast daily increased with increasing age, except that males aged 19–30 years were less likely to have eaten breakfast daily (39%) compared to males aged 15–18 years (55%). Similar to children, adults living in the most deprived areas (NZDep2006 quintile 5) were least likely to eat breakfast daily (males 55%; females 57%) compared to those living in quintile 1 (males 72%; females 79%) (University of Otago and Ministry of Health 2011).

The OPIC project collected data in 2005 from 4215 South Auckland adolescents (aged 12-17 years), 59% were Pacific ethnicity, and most in Years 9, 10 or 11. Fifteen percent of students reported that they do not usually eat breakfast, with only 57% of females and 59% of males having had breakfast 4 or 5 of the last 5 school days (Utter et al 2008). A sub-sample of 2495 students of Pacific ethnicity in the OPIC study (40% Samoan, 27% Cook Island, 21% Tongan and 11% other Pacific) found that many were skipping breakfast on school days, with obese students less likely to have had breakfast 4 or 5 of the last 5 school days (45%) compared to healthy weight students (57%). Qualitative interviews with Pacific families (n=68) in the same study found that for both adolescents and their parents, lack of available time was the main reason for not eating breakfast in the morning (Teevale et al 2010).

Qualitative research conducted with 12 focus groups, 18 family/whānau groups, 48 indepth interviews with parents and 10 interviews with children, found weekday breakfasts were often rushed, with many parents eating separately (e.g. later or somewhere else) from their children. Weekend breakfasts represented a chance for family/whānau time, being more relaxed, but possibly more unhealthy than weekday breakfasts (Whitfield et al 2007).

Does the number of eating occasions per day affect body size?

Evidence statement	Regular frequency of eating (three or more times a day) may be related to lower body size in children and adolescents.	
Grade	A	
Evidence statement	Adults who are concerned about weight maintenance or weight loss should focus on energy intake over the day rather than eating frequency, as there does not appear to be an association with body size. However, a greater number of eating occasions can result in higher energy intake.	
Grade	A	
Component	Rating	Notes
Evidence base	Excellent	5 Level-I studies assessed body size. See Appendix 2 Table 5b for details of the studies used to inform this evidence statement.
Consistency	Good	
Impact	Good	
Generalisability	Good	
Applicability	Excellent	Specifically for Pacific children and adolescents

Summary of key studies used for the evidence statement

Eight systematic reviews have been published since 2005 on the effect that eating regularly has on body size (Wang et al 2016; Raynor et al 2015; Schoenfeld et al 2015; Kaisari et al 2013; Kant 2014; Mesas et al 2012; Koletzko and Toschke 2010; Palmer et al 2009). There are two hypotheses in the literature about why eating frequently may assist with maintaining a healthy body weight: a metabolic advantage due to a diet-induced thermogenic effect, and reduced hunger or increased satiety and consequently lower energy intake throughout the day. Both of these have not been supported by the literature (Kant 2014).

Four systematic reviews reported studies in adults; most of these were randomised controlled trials for weight loss or weight maintenance (Raynor et al 2015; Schoenfeld et al 2015; Palmer et al 2009; Kant 2014). Trials were generally one to three months long, and nearly all have shown no association between the number of eating occasions per day (meal frequency) and body size. Schoenfeld et al.'s meta-analysis of 15 randomised controlled trials appeared to show that the more eating occasions a day, the larger the reduction in fat free mass and body fat percentage, but following sensitivity analysis they concluded that this was largely the result of one trial in men where an adjustment was not made for total daily energy intake. They surmised that the small difference in the magnitude of effect between the numbers of eating occasions per day suggests limited practical significance in modifying eating patterns for weight loss (Schoenfeld et al 2015). Kant found no independent relationship after reviewing seven RCTs and two quasi-experimental studies in adults. They conclude that the most useful advice for adults is to focus on energy intake rather than eating frequency, but caution that a greater number of eating occasions in our current food environment of abundant, cheap, high-energy foods can lead to greater energy intake (Kant 2014).

Four systematic reviews reported studies of children and adolescents (Kant 2014; Kaisari et al 2013; Mesas et al 2012; Koletzko and Toschke 2010), mostly cross-sectional studies but some high quality prospective cohort studies. Mesas et al. (2012) found heterogeneous results in 14 cross-sectional studies, however the five with the best adjustment for confounders consistently found eating more times a day was inversely associated with excess weight. Adjustment for confounding is important as infrequent eating is associated with other unhealthy eating behaviours, especially in children. Additionally, the three good quality prospective studies (two following girls) found that eating at least three times a day predicted lower BMI and obesity (Mesas et al 2012). Kaisari et al. conducted a meta-analysis of 21 substudies (girls and boys separate from 10 cross-sectional and one case-control study), with a pooled population of 18849 subjects aged 2-19 years, finding a combined effect of an odds ratio of 0.78 for those with the highest eating frequency compared to the lowest (Kaisari et al 2013).

Key references used to inform the evidence statement

Wang YQ, Zhang YQ, Zhang F, et al. 2016. Increased Eating Frequency is Associated with Lower Obesity Risk, but Higher Energy Intake in Adults: A Meta-Analysis. *International Journal of Environmental Research & Public Health* 13(6):603.

Raynor HA, Goff MR, Poole SA, et al. 2015. Eating Frequency, Food Intake, and Weight: A Systematic Review of Human and Animal Experimental Studies. *Frontiers in Nutrition* 2: 38.

Schoenfeld BJ, Aragon AA, Krieger JW. 2015. Effects of Meal Frequency on Weight Loss and Body Composition: A Meta-Analysis. *Nutrition Reviews* 73(2): 69-82.

Kant AK. 2014. Evidence for Efficacy and Effectiveness of Changes in Eating Frequency for Body Weight Management. *Advances in Nutrition* 5(6): 822-828.

Kaisari P, Yannakoulia M, Panagiotakos DB. 2013. Eating Frequency and Overweight and Obesity in Children and Adolescents: A Meta-Analysis. *Pediatrics* 131(5): 958-967.

Mesas AE, Munoz-Pareja M, Lopez-Garcia E, et al. 2012. Selected Eating Behaviours and Excess Body Weight: A Systematic Review. *Obesity Reviews* 13(2): 106-135.

Koletzko B, Toschke AM. 2010. Meal Patterns and Frequencies: Do they Affect Body Weight in Children and Adolescents? *Critical Reviews in Food Science & Nutrition* 50(2): 100-105.

Palmer MA, Capra S, Baines SK. 2009. Association between Eating Frequency, Weight, and Health. *Nutrition Reviews* 67(7): 379-390.

Number of meals or eating occasions per day in New Zealand

The 2002 Children's Nutrition Survey of 2875 5-14 year olds found 84% consumed some food or beverage before school, more than 80% had morning tea, more than 90% had lunch, 79% had afternoon tea and 98% had something to eat in the evening (Rockell et al 2010), but it is unclear from this study what the total mean number of eating occasions per day is for children. Older children (aged 11-14 years) and children of Pacific ethnicity were less likely than other groups to consume food/drink for breakfast (Wilson et al 2006b), at morning tea and lunch (Regan et al 2008) and in the afternoon (Rockell et al 2010), so it is plausible that they would be the most likely to eat

infrequently. Data from the 2008/09 Adult Nutrition Survey (University of Otago and Ministry of Health 2011) regarding frequency of eating has not been analysed to date, so it is unclear if these same ethnic differences are present in adult New Zealanders.

Do families eating together (family mealtimes) affect diet and/or body size?

Evidence statement	Eating together as a family may improve child and adolescent diet quality and nutrition-related behaviours. There does not appear to be an effect on body size.	
Grade	B	
Component	Rating	Notes
Evidence base	Excellent	4 SR on body size. 4 SR on diet quality. See Appendix 2 Table 5c for details of the studies used to inform this evidence statement
Consistency	Good	
Impact	Satisfactory	
Generalisability	Good	The 1 RCT and most of the PCS are from the USA.
Applicability	Good	NZ evidence that this is already a relatively common behaviour in families with younger children, so the advice would be more relevant for families with adolescents. For some families this has been found to be practically difficult.

Summary of key studies used for the evidence statement

Four systematic reviews have been published since 2008 that considered the frequency of shared family meals on child or adolescent body size. Many noted that it is reasonable to expect an association between the two given the evidence that families who eat together appear to have a better nutritional intake. However, the causation in this case is not clear. The 2015 Dietary Guidelines Assessing Committee reported on the one randomised controlled trial to date which has assessed this hypothesis (Haines et al 2013). This six month intervention with 121 families of 2-5 year olds attempted to improve the three household routines of family meal frequency, adequate sleep and TV watching (removing TV from child's bedroom). At the end of the intervention, there was no significant effect on family meal frequency, so even though there was a reduction in BMI (but not BMI Z-score) this could not be related to the frequency of family meals (Dietary Guidelines Assessing Committee 2016a). They also examined five prospective cohort studies, three with no association and two with mixed associations. They conclude that the limited evidence shows an inconsistent relationship between the number of family meals and body weight of children in the United States (Dietary Guidelines Assessing Committee 2016a). Earlier systematic reviews which included studies in other countries found inconsistent and weak evidence of an association (Valdés et al 2013) but in the meta-analysis conducted by Hammons and Fiese (2011) the pooled odds-ratio was less than one (0.88) suggesting that children and adolescents were 12% less likely to be overweight in families that had at least three shared meals together weekly, and that age was not a significant moderator.

Four recent systematic reviews have investigated the effect of shared family meals on diet quality, three of which concluded that family meals contribute to a healthy diet for children and adolescents. The reviews are largely based on cross-sectional studies, but also consider a small number of prospective cohort studies. Hammons and Fiese (2011) performed a meta-analysis with a pooled sample of 56,919 participants (with mean ages ranging from 2.8 to 17 years) from cross-sectional studies. Their results suggested children and adolescents in families that share at least three meals a week have a 20% reduction in the odds of eating unhealthy foods, and a 24% increase in the odds of eating healthy foods, compared to families that shared few or no meals together. They also report

on pooled estimates from three studies in relation to disordered eating in teenagers, finding adolescents that share at least five meals a week with their family are 35% less likely to engage in disordered eating than those that have less than two meals a week together (Hammons and Fiese 2011). Woodruff and Hanning (2008) and Berge (2009) also concluded that there was a clear association between the frequency of family meals and child and adolescent diet. However, although some longitudinal studies also show this association, it is difficult to assign causality. The 2015 Dietary Guidelines Advisory Committee concluded that there is not enough evidence to conclude that family meals improve dietary intake in the United States, as there were only two analyses of data on this, both from the same longitudinal cohort of adolescents followed over five and ten years, respectively (Dietary Guidelines Assessing Committee 2016b).

Family meals are often used in research as a proxy-variable for measuring family functioning (organisation of daily routines), family connectedness and family 'quality time' (Berge 2009; Hammons and Fiese 2011), and the evidence reviewed supports the view that family mealtimes may have a protective effect on nutritional intake. However, family mealtimes have proved to be a difficult social behaviour to influence (Haines et al 2013), and given the changing nature of work with greater numbers of women in longer hours of employment and with more flexible working hours for both men and women, changing family structure and living arrangements, and increasing after-school activities, many families may find it difficult to come together for meals every day.

Key references used to inform the evidence statement

Dietary Guidelines Assessing Committee. 2016a *Evidence Summary: What is the Relationship between Frequency/Regularity of Family Meals and Measures of Body Weight in U.S. Population Groups?* Washington DC: United States Department of Agriculture.

Dietary Guidelines Assessing Committee. 2016b. *Evidence Summary: What is the Relationship between Frequency/Regularity of Family Meals and Measures of Dietary Intake in U.S. Population Groups?* Washington DC: United States Department of Agriculture.

Valdés J, Rodríguez-Artalejo F, Aguilar L, et al. 2013. Frequency of Family Meals and Childhood Overweight: A Systematic Review. *Pediatric Obesity* 8(1): e1-e13.

Hammons AJ, Fiese BH. 2011. Is Frequency of Shared Family Meals Related to the Nutritional Health of Children and Adolescents? *Pediatrics* 127(6): e1565-74.

Berge JM. 2009. A Review of Familial Correlates of Child and Adolescent Obesity: What has the 21st Century Taught Us so Far? *International Journal of Adolescent Medicine and Health* 21(4): 457-483.

Woodruff SJ, Hanning RM. 2008. A Review of Family Meal Influence on Adolescents' Dietary Intake. *Canadian Journal of Dietetic Practice & Research* 69: 14-22.

Family mealtimes in New Zealand

The 2007 New Zealand Children's Food and Drinks Survey found 58% of 5-16 year olds have their main meal sitting down with the rest of the household everyday, that is, seven days a week (National Research Bureau 2008). However this included when they were sitting down in front of the TV, with 61% of parents reporting that they sometimes had the main meal in front of the TV (21% of whom reported that this happened every day).

The Youth '07 nationally-representative survey of 9,107 13-17 year olds found that approximately 60% of adolescents share a meal with their family five or more times a week (Utter et al 2013). One in four students (23.6%) shared a meal with their family fewer than two times in the previous week or never) and these adolescents were more likely to be female, Māori or Pacific ethnicity, or live in a high deprivation area. Eating family meals every day was positively associated with healthier eating behaviours, such as meeting the daily recommendations for fruit and vegetable consumption (OR 1.8) and always eating breakfast (OR 2.8) when compared to students who infrequently shared meals with their families (fewer than two times in the previous week or never). These differences were statistically significant after controlling for the effects of age, sex, ethnicity and area-level deprivation (Utter et al 2013). However, the mean BMI of students sharing family meals seven or more times a week was not statistically different to that of those students sharing family meals twice a week or less often, after controlling for the demographic characteristics of students (Utter et al 2013).

In the Youth '12 Survey, greater frequency of family meals was also associated with fewer depressive symptoms and emotional difficulties, even after controlling for age, sex, ethnicity, neighbourhood deprivation and household poverty. Utter et al (2016c) report that family meals may be particularly important for females as the protective association was stronger regarding depressive symptoms for females than for males.

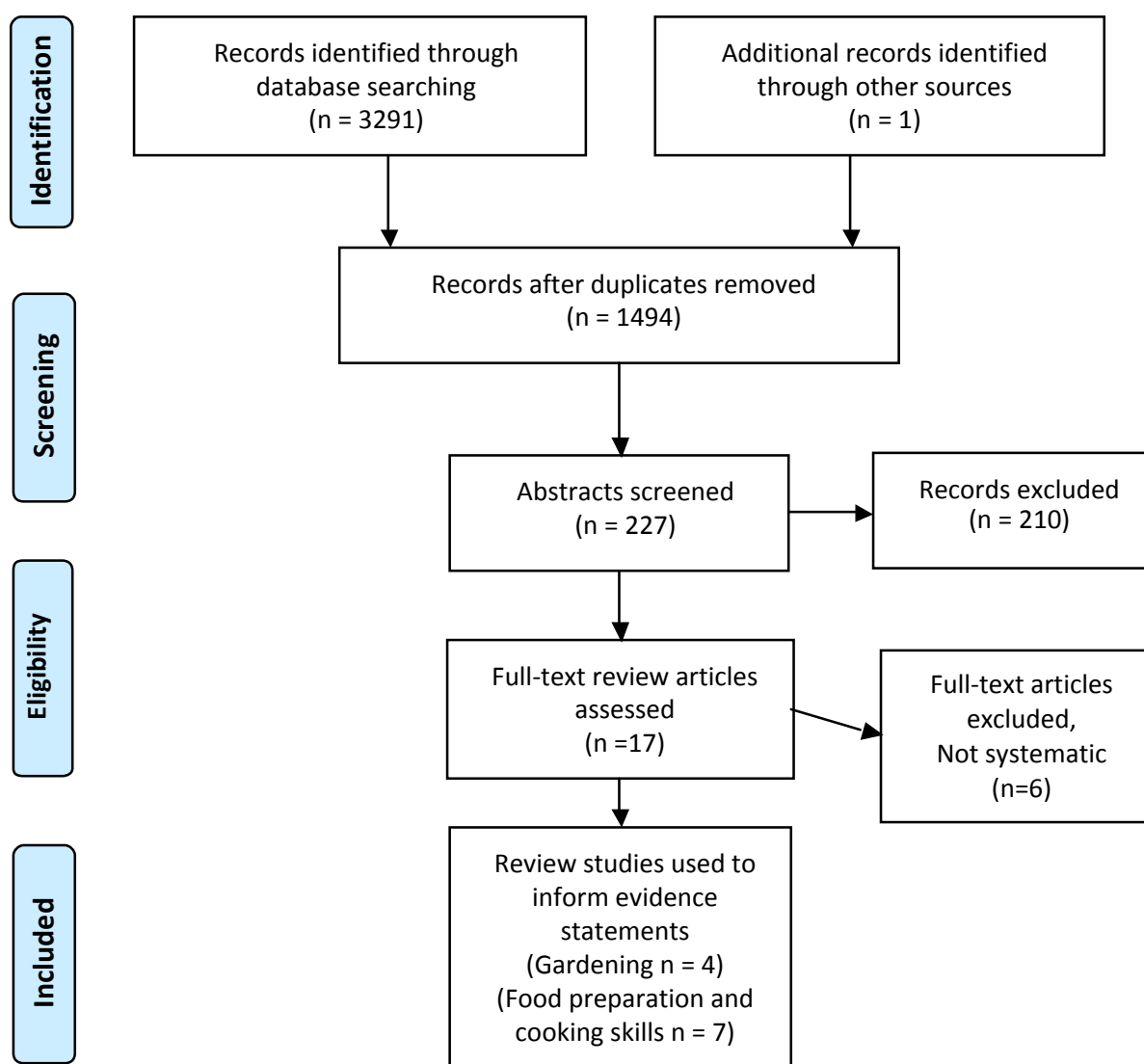
The 2005 OPIC study of 4215 South Auckland adolescents (aged 12-17 years) of predominantly Pacific ethnicities, found 42% of students had a meal with their family on all of the past five school nights. Older teenagers were less likely to have eaten with their family every day than younger adolescents, and males were slightly more likely than females to eat with their family everyday. Ethnicity was not associated in this study with the frequency of family meals (Utter et al 2008). Students eating meals with their families on all the previous five school nights had a lower mean BMI than students who did not eat any meals with their families. However, the association no longer remained after adjusting for age and gender.

Food literacy

Literature search

Figure 10 outlines the literature search process followed to review the evidence about food literacy, including participating in food production (gardening), meal planning and preparation and cooking. For the literature search strategy and criteria, and an explanation of the method followed to assess the evidence and develop the evidence statements, see Appendix 1.

Figure 10: Food literacy literature search



Does involvement in meal selection, preparation and cooking affect diet and/or body size?

Evidence statement	Involvement in food preparation and cooking improves food literacy (the knowledge, skills and behaviours needed to make healthy food choices). Cooking classes in schools and community kitchens may assist with the development of skills and positive nutrition-related behaviours.	
Grade	C	
Component	Rating	Notes
Evidence base	Satisfactory	Two Level-I, four Level-III and one Level-IV SRs. See Appendix 2 Table 6a for details of the studies used to inform this evidence statement
Consistency	Satisfactory	RCTs for cooking classes have had mixed results, unclear if long-term effect and problematic tools for data collection in most studies.
Impact	Excellent	
Generalisability	Excellent	
Applicability	Excellent	A minority of children are given the opportunity to learn food knowledge and skills at home. Evidence that there is patchy access to cooking classes in schools and the community.

Summary of key studies used for the evidence statement

Food literacy has been defined as “the capacity of an individual to obtain, process and understand basic information about food and nutrition as well as the competence to use that information in order to make appropriate health decisions” (Kolasa et al 2001) and more broadly as “a collection of inter-related knowledge, skills and behaviours required to plan, manage, select, prepare and eat foods to meet needs and determine food intake” (Vidgen and Gallegos 2014). Vaitkeviciute et al (Vaitkeviciute et al 2013) in their systematic review of the relationship between food literacy and adolescent dietary intake, explain that concepts of food literacy move beyond ‘nutrition knowledge’ to include skills, capabilities and behaviour. Their review of thirteen (mixed quality) studies suggest that food skills and behaviours learned in adolescence are sustained later in life, pointing to a longitudinal study which found that adolescents who assisted in preparing dinner were more likely to engage in food preparation behaviours five years later (Laska et al 2011). However, overall there was a lack of studies assessing the broad aspects of food literacy, with most studies to date tending to use nutritional knowledge as a proxy for food literacy (Vaitkeviciute et al 2013).

A potential way to improve food literacy is through school or community-based cooking classes or programmes. Every one of the eight primary school cooking class programmes included in the systematic review by Hersch (2014) had a significant short-term effect on one or more nutrition-related behaviours (food-related preferences, attitudes or consumption). School-aged children appeared to be more willing to try foods after involvement in the preparation and/or cooking of that food, and consumption increased. However, studies on cooking classes have used many different tools, mostly self-report with limited follow up, to measure change, and determining best practice was difficult (Hersch et al 2014).

There have been three recent systematic reviews of studies about programmes designed to improve adult food literacy (McGowan et al 2015; Reicks et al 2014; Iacovou et al 2013), all finding a diversity of study quality, tools for data collection and measurement with an over reliance on self-report data, making it difficult to show a causal effect. McGowan et al (2015) conclude that the limited dietary changes evident in existing interventions suggest that a comprehensive approach to improving both food preparation, knowledge and cooking skills, such as found in Jamie's Ministry of Food programme (Flego et al 2014), is required in order to see meaningful changes in dietary quality.

One systematic review (Schembri et al 2016) included studies which reported health outcomes, such as BMI and metabolic measures, following food literacy interventions. However, this review was restricted to studies about Aboriginal and Torres Strait Islanders in Australia. The six studies the authors reviewed (covering 348 subjects across both urban and remote settings) found nutritional education interventions had the greatest impact when they included cooking skills workshops, group education sessions and store interventions (such as labels on store shelving to identify healthier options or encouraging switching to a healthier choice), and that the most substantial impact of these types of interventions was on BMI (Schembri et al 2016).

Key references used to inform the evidence statement

Schembri L, Curran J, Collins L, et al. 2016. The Effect of Nutrition Education on Nutrition-Related Health Outcomes of Aboriginal and Torres Strait Islander People: A Systematic Review. *Australian and New Zealand Journal of Public Health* 40(S1): S42-S47.

Dudley DA, Cotton WG, Peralta LR. 2015. Teaching Approaches and Strategies that Promote Healthy Eating in Primary School Children: A Systematic Review and Meta-Analysis. *International Journal of Behavioral Nutrition and Physical Activity* 12.

McGowan L, Caraher M, Raats M, et al. 2015. Domestic Cooking and Food Skills: A Review. *Critical Reviews in Food Science & Nutrition*: 0.

Vaitkeviciute R, Ball LE, Harris N. 2013. The Relationship between Food Literacy and Dietary Intake in Adolescents: A Systematic Review. *Public Health Nutrition* 18(4): 649-658.

Hersch D, Perdue L, Ambroz T, et al. 2014. The Impact of Cooking Classes on Food-Related Preferences, Attitudes, and Behaviors of School-Aged Children: A Systematic Review of the Evidence, 2003-2014. *Preventing Chronic Disease* 11: E193.

Reicks M, Trofholz AC, Stang JS, et al. 2014. Impact of Cooking and Home Food Preparation Interventions among Adults: Outcomes and Implications for Future Programs. *Journal of Nutrition Education and Behavior* 46(4): 259-276.

Iacovou M, Pattieson DC, Truby H, et al. 2013. Social Health and Nutrition Impacts of Community Kitchens: A Systematic Review. *Public Health Nutrition* 16: 535-543.

Meal preparation and cooking skills in New Zealand

Approximately 80% of secondary school students in the Youth'12 survey reported that they can cook a meal from basic ingredients either fairly or very easily (Utter et al 2016b). Reported cooking ability was positively associated with better nutritional indicators, better mental health indicators, and stronger family connections. For example, adolescents reporting the greatest cooking abilities were

approximately twice as likely to meet the recommendations for fruits and vegetables. However, greater cooking ability was also associated with higher body mass index. Some young New Zealanders do not have the food literacy required to plan, manage, select, prepare and eat foods to meet the Nutrition Guidelines. Twenty percent of secondary school students in the survey self-reported not being able to cook a meal from basic ingredients such as raw vegetables or foods either at all or without help (Utter et al 2016b).

Only some children in New Zealand are given the opportunity at home to learn meal preparation and cooking skills. The 2007 New Zealand Children's Food and Drinks Survey found 58% of children aged 5-16 years sometimes help plan meals, which includes suggesting what to eat, or how to prepare or cook or serve the meal (National Research Bureau 2008). Only 14% of children 'often' helped to plan meals, with a greater proportion of children aged 8-16 years (17%) than younger children (8%) 'often' planning meals, and a greater proportion of Māori (22%) and Asian (25%) parents compared to Pacific (11%) and European/Other (11%) parents reported that their children 'often' planned meals. A greater proportion of children living in areas of high deprivation (19%) and mid-deprivation (16%) 'often' planned meals, compared to children living in the least deprived areas (10%).

Eight percent of school-aged children in the 2007 New Zealand Children's Food and Drinks Survey were reported to help prepare or cook food several times a week, 15% help with this nearly every week, and a further 23% help with food preparation or cooking about every second week (National Research Bureau 2008). Children of Asian ethnicity (54%) and children living in areas of low deprivation (43%) and high deprivation (40%) had the highest proportions of children who rarely (less than once a month) or 'never' helped with the food preparation or cooking.

The New Zealand Medical Association has recently called for it to be a statutory requirement that all schools provide food skills including cooking and growing food (New Zealand Medical Association 2014). Schools are required to promote healthy food and nutrition to students under clause 5 in the National Administrative Guideline (Ministry of Education 2013). Food literacy is arguably a component of the promotion of healthy food and nutrition. However, the NZ Curriculum states only that "it is expected that all students will have had opportunity to learn practical cooking skills by the end of year 8", covering one component of food literacy but excluding the development of the ability to choose and cook nutritious food (Gorton 2016).

An investigation into the perspectives of New Zealand men towards healthy eating was conducted in 12 semi-structured interviews with mean 75-89 years of age (Wham and Bowden 2011). Factors that played a role in their ability to eat healthily included a lack of nutrition knowledge, and cooking skills coupled with limited finances, frequently eating alone, and unreliable transport. It was recommended that community programs should aim to identify those deemed at most nutritional risk in this age range, and provide knowledge and skills to promote meal sharing (Wham and Bowden 2011). Another study examined the 'state of change' distribution with regards to fruit and vegetable intake among 518 New Zealand (Jury and Flett 2010). This study found a need for simple health messages for men that promote everyday, affordable produce within the context of the dietary guidelines, pointing to the potential for community programs to support the behaviour change that would come with increased food skills and knowledge in participants (Jury and Flett 2010).

Does involvement in gardening affect diet and/or body size?

Evidence statement	Gardening at school, when integrated into the wider curriculum, may improve children and young people's access to, preference for, and consumption of vegetables and fruits.	
Grade	C	
Component	Rating	Notes
Evidence base	Satisfactory	One Level-I and three Level-III SRs. See Appendix 2 Table 6b for details of the studies used to inform this evidence statement
Consistency	Good	Poor quality data collection in most studies.
Impact	Satisfactory	Small effect sizes
Generalisability	Good	
Applicability	Good	

Summary of key studies used for the evidence statement

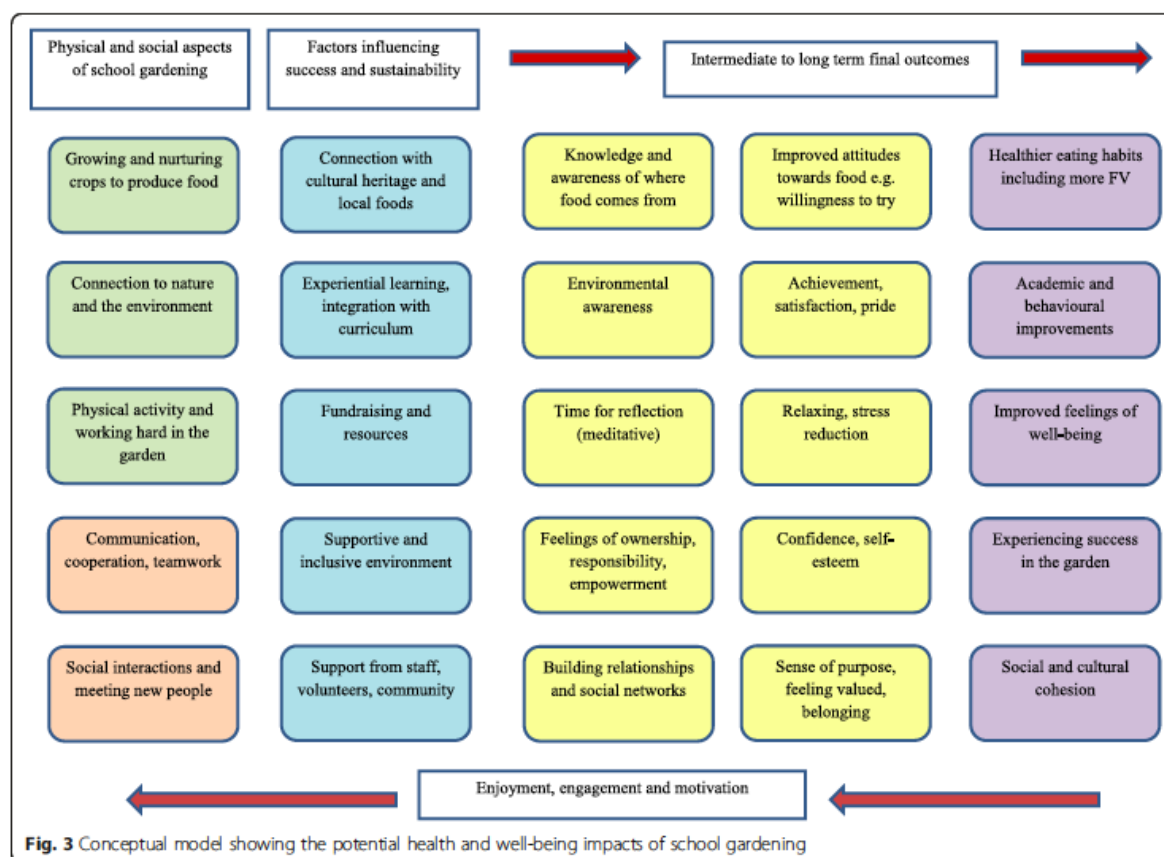
Four recent systematic reviews have found limited quantitative evidence for the positive effect of school gardens on children's nutrition, particularly increased preference for and consumption of vegetables and fruits (Ohly et al 2016; Dudley et al 2015; Langellotto and Gupta 2012; Robinson-O'Brien et al 2009). In comparison to standard curriculum-based nutrition education (for example, a lesson in the classroom on the nutrients in fruits) experiential learning in a school garden has been found to have a greater influence on children's consumption/energy intake and increasing nutritional knowledge (Dudley et al 2015). Langellotto and Gupta (2012) found in their statistical meta-analysis that participation in nutrition education led to an increase in nutrition knowledge, but positive attitudinal (e.g. increased preference for fruit and vegetables) and behavioural changes (e.g. increased consumption) were primarily documented in the gardening programmes. They propose that gardening increases access to healthy foods, particularly vegetables, while decreasing the reluctance children may have to try novel foods (Langellotto and Gupta 2012).

However, most studies conducted on this topic have used self-reported outcome data to measure changes in preference, consumption and attitudes, which is likely to be affected by social desirability bias. Studies also had limited follow-up periods so it is unclear if any immediate changes are sustained. All of the systematic reviews pointed to a need for more high-quality studies on school gardens in order to be confident of a causal effect of gardening on nutrition behaviours.

A cross-cutting qualitative theme in the literature is that school gardens need to be integrated into the wider curriculum to maximize opportunities for learning, which requires teacher involvement in developing and delivering the programme, with support from other stakeholders in the school and wider community. An overdependence on volunteers and underfunding were often found in studies to threaten the sustainability of gardens (Ohly et al 2016; Langellotto and Gupta 2012).

Ohly et al (2016) synthesized findings from qualitative studies on school gardens to build a conceptual model (Figure 11) detailing how school gardens lead to health and wellbeing improvements for children. They point to a virtuous feedback loop whereby children (and teachers, parents and community volunteers) are motivated to continue gardening from seeing the perceived benefits, which contributes to the ongoing success and sustainability of school gardening programmes.

Figure 11: Conceptual model showing the potential health and wellbeing impacts of school gardening, reproduced from Ohly et al (2016)



Systematic reviews have not been conducted to date to examine the hypothesis that gardening improves body size outcomes, and there have been no reviews of gardening programmes aimed at improving eating behaviours among adults.

Key references used to inform the evidence statement

Ohly H, Gentry S, Wigglesworth R, et al. 2016. A Systematic Review of the Health and Well-being Impacts of School Gardening: Synthesis of Quantitative and Qualitative Evidence. *BMC Public Health* 16(1): 286.

Dudley DA, Cotton WG, Peralta LR. 2015. Teaching Approaches and Strategies that Promote Healthy Eating in Primary School Children: A Systematic Review and Meta-Analysis. *International Journal of Behavioral Nutrition and Physical Activity* 12.

Langellotto GA, Gupta A. 2012. Gardening Increases Vegetable Consumption in School-Aged Children: A Meta-Analytical Synthesis. *HortTechnology* 22(4): 430-445.

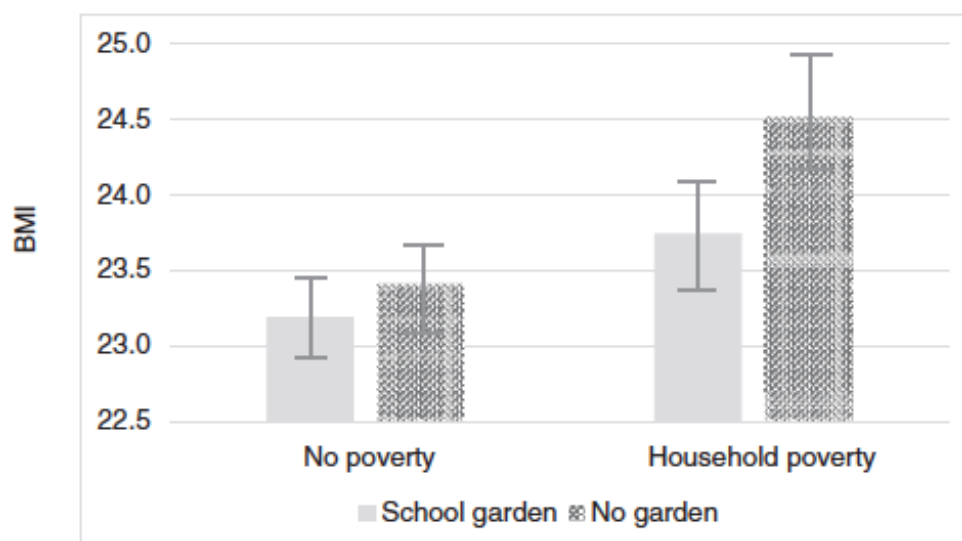
Robinson-O'Brien R, Story M, Heim S. 2009. Impact of Garden-Based Youth Nutrition Intervention Programs: A Review. *Journal of the American Dietetic Association* 109(2): 273-280.

Gardening in New Zealand

Over the last few years there has been recognition in New Zealand that gardening is a potential way to reduce the high prevalence of chronic disease in communities with poor health. Earle et al. (2011) interviewed 35 Auckland and Wellington-based community garden coordinators and found that one of the benefits of community gardening initiatives was in reconnecting people with “how food is grown and produced”. The many improvements and health benefits for individuals covered the four domains of the Te Whare Tapa Whā model of health (improved nutrition and access to fruit and vegetables, increased physical activity, stronger communities, and enhanced mental and spiritual health) (Earle 2011). Findings of this research suggest that community garden projects assist in health outcomes and addressing health inequalities through creating a place and activity that is focused on healthy food.

The Youth’12 survey of a representative sample of 8,500 secondary school students in New Zealand found approximately half (55%) of secondary schools had a fruit/vegetable garden for students to participate in, with few or no differences in the presence of a school garden by school characteristics (school funding source, single sex or co-educational, school size, or socioeconomic ranking of the school) (Utter et al 2016a). School gardens were statistically associated with lower measured BMI and less frequent fast food consumption, controlling for student- and school-level covariates. There were no associations between school gardens and student fruit or vegetable consumption or physical activity. School gardens appeared to “buffer” the effect of household poverty on BMI, such that students experiencing household poverty observed the greatest benefit from school gardens (Figure 12).

Figure 12: Visual representation of the moderating effect of school gardens on the relationship between household poverty and mean BMI, reproduced from Utter 2016a.



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Appendix 1: Detail regarding the methods used in How We Eat

Method for consultation on topics to include

To identify topics of relevance for the report an online consultation was held with key experts in the fields of public health, nutrition, ethnic/cultural food practices and health promotion. A 'long-list' of potential topics was developed by the authors based on prior knowledge and by undertaking a literature search of modifiable food and eating behaviours relevant to each stage of the life-cycle.

An electronic survey was developed and emailed to 70 individuals identified by the authors and the Ministry of Health as 'key experts'. The survey asked participants to rank the proposed topics for inclusion in the How We Eat project. Participants were only asked about topics relevant to the life-cycle/ages for which they felt able to comment on. For example:

Q2. This survey has been ordered by life-stage, so that you comment on topics aligned with your expertise. Based on your work, experiences and/or research, are you able to comment on infancy (Under 1 year old) nutrition behaviours? Select one option – Yes / No [skip section]

Q3. Please rank these topics in order from most important (1) to least important (8) for current health promotion about nutrition behaviours in infancy (under 1 years old) in New Zealand. Please rank all option(s). NB: Randomised order of response categories so each participant is presented with the responses in a different order.

Partner support for breastfeeding	<input type="text"/>
Community support for breastfeeding	<input type="text"/>
Responsive or demand breastfeeding	<input type="text"/>
Formula/bottle feeding behaviours	<input type="text"/>
Timing of introduction to solids	<input type="text"/>
Adult role modelling of healthy eating	<input type="text"/>
Responsive or baby-led (solids) feeding	<input type="text"/>

Participants were then asked if there were other topics relevant to that life stage that they considered to be important for current health promotion about nutrition behaviours in New Zealand, and invited to provide details about any important grey literature, case studies, expert opinion etc. on nutrition behaviours (for that life stage) which may be missed in a literature search. After repeating the above questions for each life stage (infancy, early childhood, school-aged children, adults, older adults) with different ‘long-lists’ of potential topics, survey participants were asked if they had any further comments to make on health promotion messages regarding healthy eating for New Zealanders.

The survey was open for two weeks from 1 August until 12 August 2016. Two reminder emails were sent to non-respondents.

Participants of the consultation on topics

A total of 45 responses were received (64% of invited participants). Table 1 summarises the respondents by job title and organisation.

Table 1: Job titles/positions and organisations of respondents to the consultation on topics

Job title / position	Organisation	Number
Public health advisor	Primary healthcare organisation	2
Doctor / Paediatrician	District Health Board	2
Active Families	District Health Board	2
Dietitian / Nutrition advisor	District Health Board	4
Clinical psychologist	District Health Board	1
Public Health Dietitian	Regional Public Health Unit	3
Health promotion advisor	Regional Public Health Unit	1
Public health promoter/advisors	Sport Waikato/BoP / Wellington	4
Manager Nutrition and Physical Activity	Health Promotion Agency	1
Nutrition Policy/Research	Ministry of Health	2
Chief Advisor	Ministry of Health	2
CEO / Dietitian	NZ Nutrition Foundation	2
Dietitian and project manager	Agencies for Nutrition Action	3
Kaiwhakahaere	Hapai te Hauora	1
National advisor	Royal New Zealand Plunket Society	1
Public Health Strategic Advisor	Heart Foundation	1
Education settings manager	Heart Foundation	1
Director LENScience	Liggins Institute	1
Academic (Psychology)	University of Auckland / Massey	2
Academic (Nutrition)	University of Auckland / Otago / AUT	7
Academic (Ageing/Nutrition)	University of Auckland	1
Academic (Pacific Health/Nutrition)	University of Auckland	1

Prioritization of topics and creation of research questions

The long-list of possible topics was then prioritised according to responses received in the survey and six topics for inclusion in the project were decided on by the authors in discussions with the Ministry of Health. The associated research questions below were developed to guide the literature searches.

1. Family support for breastfeeding

Does partner and/or family and whānau support for breastfeeding affect initiation and/or duration of breastfeeding?

2. Parental feeding practices and parenting style

Does repeated exposure to novel foods and non-food rewards (praise, encouragement, stickers) improve diet in early childhood?

Do coercive food practices (controlling or restricting children's diet, pressure to eat, punishment and rules) affect child diet and/or body size?

Does general parenting style and/or feeding style affect child diet and/or body size?

3. Role-modelling of healthy eating

Does parental role-modelling of healthy eating behaviours affect child and/or young people's eating behaviours and diet?

Does teacher role-modelling of healthy eating behaviours affect child diet and body size?

4. Mealtimes

Does eating or skipping breakfast affect diet and/or body size?

Does the number of meals-per-day/eating-occasions-per-day affect diet and/or body size?

Do families eating together (family mealtimes) affect diet and/or body size?

5. Responsive feeding and eating

Do responsive feeding practices affect infant and young child diet and body size? (e.g. the recognition of satiety cues)

Does limiting distractions while eating (including turning off screens/TV) improve child diet and body size?

Do responsive eating techniques (recognising hunger, satiety, mindful/attentive eating) affect adult diet and body size?

6. Food literacy

Does gardening affect diet and/or body size?

Does involvement in meal selection, preparation and cooking affect child diet and/or body size?

Method for literature searches

Criteria for considering studies for inclusion in this project

This review considers studies that *assess the evidence around efficacy and/or strength of association between modifiable food and eating behaviours and diet and body size*. Consequently, the evidence came primarily from randomised controlled trial (RCTs), controlled trials, and quasi-experimental studies. However, studies using these designs are limited in behavioural research and inappropriate for some of the topics, particularly when the outcome of interest is body size (Swinburn, Gill, Kumanyika 2005). If information from systematic reviews of controlled trials was not available, we considered prospective and retrospective cohort studies. Case series, case reports, case-control and qualitative studies (which have a high potential of bias in the study designs) were only included in the report if they were based in New Zealand.

The outcomes of interest for each question were diet and/or body size which included the following: diet*(intake, patterns, quality), fruit and vegetable intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.

Studies were excluded if:

- the outcome of interest is not listed above
- focused on environmental, social or economic determinants of dietary behaviour rather than modification of the dietary behaviour itself
- focused on mechanisms rather than population health outcomes (e.g. physiological studies of metabolic markers)
- focused on diseased, unhealthy or non-free living participants (excluding overweight/obese)
- conducted in animals
- published before 2005
- not reported in English language.

Search methods for identification of studies

Electronic searches will be undertaken for the identification of studies relevant to each research question in the following databases:

- Cochrane library
- Scopus (includes Medline)
- EMBASE
- PsycInfo
- Index New Zealand
- Kiwi Research Information Service (National Library)

A Google scan for grey literature and a search of websites of relevant New Zealand organisations was also undertaken. Review articles and expert opinion were considered. Grey literature such as technical reports from scientific agencies or scientific research groups, conference proceedings, abstracts, theses or dissertations was considered only if relevant to New Zealand.

Selection of studies

The titles and abstracts of potential papers relevant to each review question were screened for duplicates and then assessed for 'inclusion', 'exclusion' or 'potentially suitable'. If the decision on inclusion or exclusion of a study based on review of the title and abstract was unclear, then the full text was obtained for review. Full texts for 'inclusion' and 'potentially suitable' were assessed against

the exclusion criteria. The reference lists of included studies were also searched for additional relevant titles and abstracts of potentially eligible studies. Any additional studies found by the authors that were not picked up by the literature searches were recorded in the appropriate box at the top of the PRISMA diagrams at the start of each chapter.

Box 1: Example of the search strategy, for the parenting topic:

Databases: Medline, Cochrane, Scopus, Embase, PsycInfo, Index New Zealand, Kiwi Research Information Service (New Zealand Research)

Search Strategy:

```
-----  
1 (food* adj3 rule*)  
2 ((diet* or snack* or treats or eat* or fruit* or vegetable* or meal* or dinner* or breakfast* or  
lunch* or supper*) adj3 rule*)  
3 (parent* adj3 style*) OR ((parent* or mother* or father* or paternal or maternal) adj7 feeding  
adj3 (style* or practi* or behavio*))  
4 (treat* adj3 food* adj3 rule*).mp.  
5 (neglect* adj3 parent*).mp.  
6 (attach* adj3 parent*).mp  
7 (protective adj3 parent*).mp.  
8 (uninvolved adj3 parent*).mp.  
9 (indulg* adj3 parent*).mp.  
10 (authorita* adj3 parent*).mp.  
11 (permissive adj3 parent*).mp.  
12 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11  
13 ((fruit* or vegetable*) adj3 intake*).mp.  
14 ("body size" or "body mass").mp.  
15 bmi.mp.  
16 weight.mp.  
17 overweight.mp.  
18 obes*.mp.  
19 diet*.mp.  
20 13 or 14 or 15 or 16 or 17 or 18 or 19  
21 12 and 20  
22 (meta-analy* or metaanaly*).mp.  
23 systematic review*.mp.  
24 randomi*.mp.  
25 rct.mp.  
26 (quasiexperiment* or quasi-experiment*).mp.  
27 (cohort or retrospective or prospective).mp.  
28 zealand.mp.  
29 longitudin*.mp.  
30 cross-section*.mp.  
31 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30  
32 21 and 31  
33 limit 32 to (english language and yr="2005 -Current")
```

Total Results = 2252

Endnote Detected Duplicates = 1373

Medline = 574

Cochrane = 148

Scopus = 677

Embase = 554

PsycInfo = 234

Index New Zealand = 8

Kiwi Research Information Service = 57

Method for determining the body of evidence

For each research question included in this project, an assessment of the total body of evidence (the sum of all the included studies) was undertaken to inform the development of recommendations for general population advice. The method below describes how we assessed the evidence, based on the Australian National Health and Medical Research Council (NHMRC) levels of evidence and grades for recommendations (NHMRC 2009). The NHMRC method was designed for the purpose of structuring a narrative meta-synthesis of results in an evidence report (Merlin et al 2009), and has been used most recently in the systematic review process behind the 2015 Dietary Guidelines for Australians which includes some reviews of evidence related to dietary behaviours. This process appraises the evidence not only according to the 'level' of evidence, but also incorporates elements of generalisability and applicability to the groups of interest (in this case, the general New Zealand population).

There are five components which were used to determine if the body of evidence is sufficient to formulate a recommendation:

- Quantity, level and quality of the evidence
- The consistency of the evidence
- The potential impact of the proposed recommendation
- The generalisability of the body of evidence to the New Zealand population
- The applicability of the body of evidence to the New Zealand context.

The body of evidence supporting a recommendation rarely consists of entirely one rating for all the important components. For example, a body of evidence may contain a large number of studies with a low risk of bias and consistent findings, but which are not directly applicable to the New Zealand context and have only a limited potential impact. Alternatively, a body of evidence may only consist of one or two randomised trials with small sample sizes that have a moderate risk of bias but have a very large potential impact and are directly applicable to the New Zealand context and target population. The evidence grading system is designed to allow for this mixture of components, while still reflecting the overall body of evidence supporting a guideline recommendation (see Table 2).

Table 2: Matrix for rating components for each of the topics/research questions, reproduced from NHMRC (2009)

Component	A Excellent	B Good	C Satisfactory	D Poor
Quantity, level and quality	one or more level I studies with a low risk of bias or several level II studies with a low risk of bias	one or two level II studies with a low risk of bias or a SR/several level III studies with a low risk of bias	one or two level III studies with a low risk of bias, or level I or II studies with a moderate risk of bias	level IV studies, or level I to III studies/SRs with a high risk of bias
Consistency ²	all studies consistent	most studies consistent and inconsistency may be explained	some inconsistency reflecting genuine uncertainty around question	evidence is inconsistent
Impact	very large	substantial	moderate	slight or restricted
Generalisability	population/s studied in body of evidence are the same as the target population for the guideline	population/s studied in the body of evidence are similar to the target population for the guideline	population/s studied in body of evidence differ to target population for guideline but it is sensible to apply this evidence to target population ³	population/s studied in body of evidence differ to target population and hard to judge whether it is sensible to generalise to target population
Applicability	directly applicable to New Zealand context	applicable to New Zealand context with few caveats	probably applicable to New Zealand context with some caveats	not applicable to New Zealand context

SR = systematic review; several = more than two studies

- 1 Level of evidence determined from the NHMRC evidence hierarchy
- 2 If there is only one study, rank this component as 'not applicable'.
- 3 For example, results in adults that are sensible to apply to children

More information on these five components for rating the evidence are described below, adapted from the Australian National Health and Medical Research Council (NHMRC) levels of evidence and grades for recommendations (NHMRC 2009).

Quantity, level and quality of the evidence

Quantity of evidence reflects the number of the studies that have been included as the evidence base for each guideline (and is listed in the evidence summary table). The quantity assessment also takes into account the number of study participants in relation to the frequency of the outcomes measured (ie the statistical power of the studies). Small, underpowered studies that are otherwise sound may be included in the evidence base if their findings are generally similar — but at least some of the studies cited as evidence must be large enough to detect the size and direction of any effect.

Level of evidence reflects the best study types for the specific type of question (see Table 3). The most appropriate study design to answer each type of research question is level II evidence. Level I

studies are systematic reviews of the appropriate level II studies in each case. Study designs that are progressively less robust for answering each type of question are shown at levels III and IV. Systematic reviews of level III and IV studies are ascribed the same level of evidence as the studies included in the review to address each outcome. For example, a systematic review of cohort studies and case series for an intervention question would be given a Level III-2 ranking in the hierarchy, even if the quality of the systematic review was exceptional. The levels of evidence hierarchy is specifically concerned with the risk of bias in the presented results that is related to study design (see Explanatory note 4 to Table 3), whereas the quality of the evidence is assessed separately.

Table 3: Modified NHMRC Evidence Hierarchy: designations of ‘levels of evidence’ (given that research questions in ‘How We Eat’ are aetiological or intervention questions), reproduced from NHMRC (2000)

Level	Intervention question	Aetiology question
I ¹	A systematic review of level II studies	A systematic review of level II studies
II	A randomised controlled trial	A prospective cohort study
III-1	A pseudo-randomised controlled trial (i.e. alternate allocation or some other method)	All or none ³
III-2	A comparative study with concurrent controls: Non-randomised, experimental trial ⁴ , Cohort study, Case-control study, Interrupted time series with a control group	A retrospective cohort study
III-3	A comparative study without concurrent controls: Historical control study, Two or more single arm study ⁵ , Interrupted time series without a parallel control group	A case-control study
IV	Case series with either post-test or pre-test/post-test outcomes	A cross-sectional study or case series

Footnotes for Table 3:

1. A systematic review will only be assigned a level of evidence as high as the studies it contains, excepting where those studies are of level II evidence. Systematic reviews of level II evidence provide more data than the individual studies and any meta-analyses will increase the precision of the overall results, reducing the likelihood that the results are affected by chance. Systematic reviews of lower level evidence present results of likely poor internal validity and thus are rated on the likelihood that the results have been affected by bias, rather than whether the systematic review itself is of good quality. Systematic review quality should be assessed separately. A systematic review should consist of at least two studies (and to attain Level-I, the systematic review needs to include at least two Level-II studies). In systematic reviews that include different study designs, the overall level of evidence should relate to each individual outcome/result, as different studies (and study designs) might contribute to each different outcome.
3. All or none of the people with the risk factor(s) experience the outcome; and the data arises from an unselected or representative case series which provides an unbiased representation of the prognostic effect.
4. This also includes controlled before-and-after (pre-test/post-test) studies, as well as adjusted indirect comparisons.
5. Comparing single arm studies ie. case series from two studies. This would also include unadjusted indirect comparisons (ie. utilise A vs B and B vs C, to determine A vs C but where there is no statistical adjustment for B).

Quality of evidence reflects how well the studies were conducted in order to eliminate bias, including how the subjects were selected, allocated to groups, managed and followed up and how the study outcomes were measured.

The consistency of the evidence

The consistency component of the 'body of evidence' assesses whether the findings are consistent across the included studies (including across a range of study populations and study designs). It is important to determine whether study results are consistent to ensure that the results are likely to be replicable or only likely to occur under certain conditions. Ideally, for a meta-analysis of randomised studies, there should be a statistical analysis of heterogeneity showing little statistical difference (consistent or homogenous) between the studies. However, given that statistical tests for heterogeneity are underpowered, presentation of an I^2 statistic, as well as an appraisal of the likely reasons for the differences in results across studies, would be useful. Heterogeneity in the results of studies may be due to differences in the study design, the quality of the studies (risk of bias), the population studied, the definition of the outcome being assessed, as well as many other factors. Non-randomised studies may have larger estimates of effect as a result of the greater bias in such studies; however, such studies may also be important for confirming or questioning results from randomised trials in larger populations that may be more representative of the target population for the proposed guideline.

The potential impact of the proposed recommendation

Impact is a measure of the potential benefit from application of the guideline to a population.

Factors that need to be taken into account when estimating impact include:

- the relevance of the evidence to the research question, the statistical precision and size of the effect (including clinical importance) of the results in the evidence-base, and the relevance of the effect to the patients, compared with other management options (or none)
- the duration of behaviour required to achieve the effect, and
- the balance of risks and benefits (taking into account the size of the population concerned).

The generalisability of the body of evidence to the population

This component covers how well the subjects and settings of the included studies will match those of the Guideline recommendations, specifically the population being targeted by the Guideline and the clinical setting where the recommendation will be implemented. Population issues that might influence the relative importance of recommendations include gender, age or ethnicity, baseline risk, or the level of care (eg community or hospital). This is particularly important for evidence from randomised controlled trials (RCTs), as the setting and entry requirements for such trials are generally narrowly based and therefore may not be representative of all the patients to whom the recommendation may be applied in practice. Confirmation of RCT evidence by broader-based population studies may be helpful in this regard (see 'Consistency' above). Basically, an assessment of generalisability is about determining whether the available body of evidence is answering the research question that was asked.

The applicability of the body of evidence to the New Zealand context

This component also addresses whether the evidence base is relevant to the New Zealand population generally, or to more local settings for specific recommendations (such as rural areas or cities). Factors that may reduce the direct application of study findings to the New Zealand or more

local settings include organisational factors (e.g. resources) and cultural factors (e.g. attitudes to health issues, including those that may affect compliance with the recommendation).

Method for formulating recommendations and grading each recommendation

Following the completion of the summary matrix for each topic, the wording was developed for the recommendation. According to the NHMRC, recommendations should address the specific research question and ideally be written as an action statement. The wording of the recommendation should reflect the strength of the body of evidence. Words such as ‘must’ or ‘should’ are used when the evidence underpinning the recommendation is strong, and words such as ‘might’ or ‘could’ are used when the evidence base is weaker.

The overall grade of the recommendation was based on a summation of the rating for each individual component of the body of evidence. A recommendation cannot be graded A or B unless the evidence base and consistency of the evidence are both rated A or B. NHMRC overall grades of recommendation are intended to indicate the strength of the body of evidence underpinning the recommendation. This should assist users of the practice guidelines to make appropriate and informed judgments. Grade A or B recommendations are generally based on a body of evidence that can be trusted to guide clinical (in this case, health promotion) practice, whereas Grades C or D recommendations must be applied carefully to individual and organisational circumstances and should be interpreted with care (see Table 4).

Table 4: Definition of NHMRC grades of recommendations (NHMRC 2009)

Grade of recommendation	Description
A	Body of evidence can be trusted to guide practice
B	Body of evidence can be trusted to guide practice in most situations
C	Body of evidence provides some support for recommendation(s) but care should be taken in its application
D	Body of evidence is weak and recommendation must be applied with caution

Appendix 2: Summary tables of the studies included in evidence reviews

Table 1a: Studies used to inform the evidence statement for whānau support of breastfeeding

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes on quality
Negin, 2016	SR of RCT, PCS, CS Level-I	To quantify the impact of the grandmother on influencing a mother's BF practice	USA n=2 Brazil n=3 Europe n=2 Asia n=5 Kuwait n=1 Age of grandmother not reported	Range from 66 to 3822	8 CS, 1 RCT, 4 PCS Impact the grandmother had on BF rates and duration due to her attitude/experience with BF (n=8), 5/8 studies found sig. Positive impact on BF with grandmother's who had BF experience or were positively inclined towards BF (1.6-12.4 times more likely to exclusively BF or refrained from introducing solid food). impact on BF rates and duration when the grandmother was the main caretaker (n=2), mother up to 4.3 times more likely not to EBF impact of grandmother's education on BF rates and duration (n=1) - mothers were sig. Less likely to EBF if grandmothers were educated (Chinese study). 1RCT with intervention aimed at grandmother and adolescents saw reduced chance of exclusive BF among women who cohabitated with grandmother than those who lived apart	Protect: Grandmothers have capacity to influence exclusive BF	Difficult to accurately compared studies due to the heterogeneity of the effect measures used Cross cultural generalisability of these findings
Mitchell-Box, 2013	SR of RCT Level-I	Impact of male-partner -focused BF interventions on BF initiation, exclusivity, and continuation	USA n=2 Italy n=1 Brazil n=1	Range from 57 to 601	10 studies found in literature, only 4 had been rigorously tested and were included in the SR 4 RCT (2 RCT and 2 quasi-experimental design): 3 hospital based and 1 clinic based interventions. One study restricted participants to those that had already initiated BF, the other 3 studies tracked BF initiation. Higher initiation was seen in mother's whose partner's had attended BF	Protect	Despite the recognition that male partners play an important role in supporting BF initiation and continuation, only 4 rigorously tested

					classes/intervention. Greater exclusivity was seen in those receiving the intervention compared to control in n=3 studies. Varying results seen when analysing BF continuation in intervention vs. control groups		educational programmes aimed to strengthen male partner support for BF were found Small samples
Inoue, 2012	SR of QES, PCS and CS Level-III	To summarise the factors that have influenced the duration of BF in Japan to provide information relevant to BF promotion programmes	Japan Age of population not recorded	Range from 264 to 45,569	Total n=12 (10 CS , 1 PCS, 1 QES) 3 CS looked at support from husbands/partners 1 CS looked at association with maternal grandmothers Women were more likely to continue 'full BF' to 3 months post partum if their husbands attended antenatal classes before delivery and for BF duration Mothers who were satisfied with the involvement of the father in childcare tended to continue 'full BF' at 3 months A negative association was seen with maternal grandparents towards BF duration. Not living with maternal grandparents was positively associated with BF status at 6 months compared with those that lived with the maternal grandparents	Father = Protect Maternal grandparent = Increase	Definition of EBF differs in Japan compared to WHO definitions Most reported Japanese BF studies are cross-sectional in design, have small sample sizes, and have unclear definitions of BF
Meedya, 2010	SR of PCS, RCT, CS, QUAL Level-I	To provide a firm evidence base for designing an educational intervention that can be offered to women and their families	Aus n= 1 UK n=3 USA n=2 Canada n=1 Jamaica n=1	Range from 59 to 1249	3PCS, 1 QUAL, 1 CS, 2 RCT Women's feeding attitudes and practices are influenced by specific people in their social networks, including the baby's father, maternal grandmother, close friends and health care professionals. The attitude of the woman's partner to BF is crucial to the woman's attitude and her BF practices. Support of infant's father and society are important in BF success Father's involvement enhances the wellbeing of the mother and the child, as professional help cannot replace the day-to-day support that couples provide for each other.	Protect	Interventions discussing partner or grandparent based support are scarce in the literature Small sample sizes

Hall Moran, 2007	SR of PCS, QUAL, RCT Level-I	Review the evidence on the nature of support for breastfeeding (BF) adolescent mothers	USA n=3 Australia n=2 UK n=2 Aged 14 to 19 years	Range from 7 to 298	4 PCS, 2 QUAL, 1 RCT 2 QUAL studies showed that adolescents own mothers were found to be pivotal in their decision making regarding baby-feeding choice (with adolescents respecting their mother's advice as that of an expert). The influence of the adolescent's mother was strong if she herself had BF. 1 PCS emphasised that the adolescent's partner, family and friends were the main sources of BF support. If a family member or the baby's father had talked to the adolescent about BF they were more likely to report an intent to BF. The greater the adolescent's perceptions of paternal and peer support, the greater their intent to BF Participant's mothers support were more commonly identified than support from partners	Protect	Included papers varied in design, quality and focus – limiting the value of combining the data from them
Nelson, 2006	SR of QUAL	To systematically synthesise findings across qualitative studies conducted related to BF	USA n=8 Canada n=2 UK n=1 Cumulative data from 247 participants age 19-49 years of age	Range from 3 to 25	Total n=15 included in meta-synthesis 8 QUAL described BF support. Sources of support included partners, mothers, family, professionals, friends, groups and peer counsellors. Partners and mothers were listed as the most significant sources of emotional and instrumental support in the early post partum period (e.g. through assistance with household chores, food prep, care of other children, general approval of BF). Despite expectations, mothers sometimes reported receiving unsupportive or insufficient assistance from professionals.	Protect	Only qualitative analysis

Notes:

1. type [systematic review (SR) may include meta-analysis (MA), randomised controlled trial or randomised cross-over trials (RCT), non-randomised and quasi-experimental studies (QES), prospective and retrospective cohort studies (PCS, RCS), case series, case reports, case-control and cross-sectional studies (CS), qualitative studies (QUAL)] with level of evidence.
2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
3. particularly note if infant, young children, children, young people, adults, older adults, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 2a: Studies used to inform the evidence statement for repeated exposure of novel foods and non-food rewards

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes on quality
Nehring, 2015	SR of RCT, QES, and PCS Level-I	Whether sweet, sour, salty, bitter, umami and other specific taste experiences and feeding patterns prenatally and within the first 6 month of life affect taste and food acceptance during infancy	USA n=17 Europe n=2 UK n=1	Range from 28 to 199	<p>[add how many RCT, QES, PCS]</p> <p>Sweet: 10 studies (13 subgroups), 6 showed significant increase in intake, 7 showed no difference</p> <p>Salty: 3 studies mixed results. Higher intakes seen in infants in a higher sodium concentration in utero. Higher intakes of salty solutions seen in infants that had previous experiences with starchy food. No change in one study on the intake of salted vegetables after exposure.</p> <p>Bitter: 5 studies. 5 subgroups showed increased intake of bitter foods after exposure to bitter tastes or compared with control groups that were not exposed to bitter taste (note that exposure was only interpreted as once). One subgroup showed a decreased intake compared with control.</p> <p>Sensitivity analysis based on 29 subgroups showed:</p> <ul style="list-style-type: none"> Exp to sweet may or may not affect intake of sweet flavoured foods (7 – no difference, 3 increased intake) Exp to bitter increased intakes of bitter foods in 4 of 5 subgroups Exp to salty did not increase intake of salted food in interventional studies only 	<p>Sweet & Salty: equivocal evidence</p> <p>Bitter: increase</p> <p>Sour: inconclusive</p>	<p>Included studies had medium to good internal validity ,but external validity was poor because studies were conducted in highly selected populations</p> <p>Later food acceptance was assessed following short intervals after exposure, it is unclear whether the findings can indicate long term programming (even though there is some evidence for tracking of early food habits into later childhood).</p>
Ward, 2015	SR of RCT, QES and CS Level-I	Predictors or effectiveness of childcare educator’s practices on pre-schoolers’ healthy	Primarily African American, Latino,	Range from 19 to 275 pre-	<p>5 studies focused on nutrition.</p> <p>All 5 reported positive changes in children’s eating behaviours when educators used recommended mealtime practices. 1 mod quality QES found increased new food intake</p>	Weak evidence that educator practices	<p>Low number of high quality intervention studies</p> <p>Only one study specified SES and one</p>

		eating and physical activity behaviours	Hispanic children	school children	when using non-food rewards, encouraged to 'try one bite' and allow self-selection. 2 low-quality QES found increased intake of healthy snacks when allowed to self-serve, and increased vegetable intake when given immediate positive verbal reinforcement and non-food rewards.	positively influence pre-schoolers' eating behaviours	reported ethnicity – both important as lower SES and certain ethnicities have been linked to poorer quality diets. Lack of consideration to demographic differences Did not report on whether the nutrition related data collection tools were valid
Wolfenden, 2011	SR of RCT Level-I	Increase in fruit and vegetable consumption following intervention with repeated exposure and tangible reward (non-food, social based)	North America Western Europe <5 years of age	Range from 156 to 1658 pre-school children	2 RCT targeting child feeding practices revealed no intervention effect of repeated food exposure alone compared to no treatment at 3 most post intervention. Of these, 1 RCT found higher vegetable consumption in children receiving repeated exposure + tangible reward (non-food/social based). 2 home based RCT showed no sig increase in fruit consumption, with 1 home-based RCT finding a significant positive intervention effect in healthy weight (compared to overweight) children for combined fruit and vegetable consumption. 2pre-school based RCT's found a sig increase in fruit consumption, but no differences between groups for vegetable consumption.	Paired food exposure with tangible non-food reward can be effective Unclear regarding repeated food exposure alone	Doesn't measure long term effects of interventions (>12 months)
Barends, 2013	RCT Level-II	Whether infants who started weaning with vegetables continued eating more vegetables at 12 and 23 months than	Netherlands 12 and 23 months	12 months n=86 23 months n=81	Using 3 day food diaries, reported daily intakes of vegetables at 12 months was 38% higher (p=0.02) in the vegetable group (75 ±43 g) than in the fruit group (54 ± 29 g) At 23 months, reported daily intakes of vegetables was similar to fruits (49 ± 43, 57 ± 35 g). This result was not significant.	Increased vegetable consumption at 12 months.	Further research required into maintenance of intake

		infants that started weaning on fruits.			Findings suggest that weaning infants exclusively on vegetables results in a higher daily vegetable consumption until at least 12 months of age, and more research is needed to explore the maintenance of this effect.		
Howard, 2012	RCT Level-II	Identify key factors (maternal food preferences, child food preferences, child food neophobia, repeated exposure) that influence children's liking for fruits, vegetables, and non-core foods.	Australia 24 months of age	n = 245	Maternal preferences corresponded with child preferences Food neophobia was associated with liking fewer vegetables and fruits and trying fewer vegetables Number of repeated exposures to a new food was not significantly associated with food liking at this age		
Hetherington 2015	RCT Level-II	Test the effects of providing vegetables step-by-step in milk, and then in cereal during complementary feeding (CF) on intake and liking of pure vegetables	UK >6 months of age	n = 36	Vegetables were rotated daily (carrots, beans, spinach, broccoli). Intake, liking and pace of eating were greater in the intervention than control (intake of carrots greater than green beans) At 6 and 18 month follow ups, vegetable differences (carrot>green beans) were seen, but not group differences. Mothers reported acceptability of the structure and guidance of the approach Long term benefits need to be assessed by extending the exposure period	Early exposure to vegetables in a step-by-step method could be included in CF guidelines	

Notes:

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2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
3. particularly note if infant, young children, children, young people, adults, older adults, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 2b: Studies used to inform the evidence statement for coercive/controlling feeding practices

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes on quality
Russell, 2016	SR of PCS and CS Level-I	Parental feeding practices (pressure and restriction to eat) and dietary outcomes or child weight	Children living in disadvantaged communities, nearly all USA, one in Netherlands and one Germany	49 to 296	8 studies: 4 PCS and 4 CS Two higher quality studies found association between parental use of ‘pressure’ and infant weight. Not observed in small studies. ‘Feeding restriction’ associated with higher BMI in two studies but not in another. Both parental feeding pressure and restriction were associated with greater intakes of unhealthy foods and beverages in two studies, not in one, and greater energy intake in one study. All studies generally suggestive that maternal feeding behaviours are a reaction to child’s weight status. Parents with heavier children use more restriction and less pressure to eat.	Increase	Small numbers as often subgroup analysis of disadvantaged children within larger studies
Shloim, 2015	SR of PCS, CS and QES Level-I	Parenting styles, feeding styles, feeding practices and BMI, obesity or change in weight	Children aged 4-12 years in Australia, UK, Malaysia, Germany, Brasil, USA, Netherlands	n=77 (USA) to n=2021 (Netherlands)	Feeding practices combined: 17 CS, 4 PCS, 1 QES. Restriction/control feeding: appears to be associated with children with higher BMI across different contexts and cultures, are subject to parental perception about their child’s weight and are modifiable. In trials when restrictive feeding practices decreased, children lost weight, reduced total energy intake and parents were not concerned about child’s weight anymore. PCS unclear findings –suggested that restriction can be protective against weight gain in younger (5-6 years) but not older (10-12 year old) children. Limit setting rather than excessive restriction effective in weight loss trials for children. Pressure to eat: PCS show this is applied in response to lower child BMI. Monitoring child intake: more often applied to children with a higher BMI. Useful to apply limits.	Unclear possibly restriction= increase	Many feeding practices tools measure slightly different concepts. Need validated ‘gold standard’ measure (nearly all parent report at present)
Bergmeier 2013	SR of PCS and CS	Child temperament, maternal	Preschoolers in USA (10), England (5),		5 CS and 13 PCS. Found significant relationship (effect size more than 1 in half of studies) between child temperament (surgency/extraversion, difficult and	Child temperament can	Parent self-report often used

	Level-I	feeding practices and BMI	Norway (2) and Australia (1)		distress to limitations) and more rapid weight gain in infancy. Associations between maternal perceptions of child temperament and maternal feeding practices evident from infancy which continue through preschool years (smaller effect sizes in those studies 0.11-0.1). Maternal parenting stress, mental health and attitudes towards body weight are also important. Parents who are concerned about child's energy regulation skills are more likely to implement restrictive feeding strategies which in turn could potentially reinforce child's poor self-regulation and sensitivity to innate satiety cues.	increase maternal restrictive feeding practices and BMI	
Hurley, 2011	SR of CS, PCS and QES Level-I	Responsive feeding (recognising satiety cues, controlling, restrictive and indulgent) and weight gain, body size, adiposity or diet (intake of fruit/veg)	0-60 months. Three childhood age groups examined: infants, toddler/preschool, early elementary. Most in US, others also high-income countries (Australia, Europe)	QES n=27, 31 and 37, CS n=23 to 755 and PCS n= 117 and 971 parent-child dyads	2 QES, 23 CS, 2 PCS. 15 out of 20 studies in toddler/preschool period. Longitudinal designs show high birth weight or weight at baseline led to increased restricted feeding practices and lower birth weight led to increased pressure to eat or indulgent feeding. CS studies suggest a positive relationship between indulgent (emotional/calming) feeding and overweight/obesity, and pressure to eat and underweight/lower BMI (unclear causality). Most consistent finding was control/restrictive feeding and higher BMI. Negative association for indulgent feeding and intake of fruit/veg, and positive association with intake of soda and sweets.	Unclear except control= increase	12 different self-report questionnaires used and 4 different observational techniques.
Fraser, 2011	SR of CS, PCS Level-IV [check]	Paternal parenting style, feeding practices and child weight gain	Father-child dyads in UK (3), US (4) and Australia (1), mostly preschool, early primary school	N=23 to 4,983	5 studies included measurement of father's feeding practices. Paternal pressure to eat negatively correlated with BMI in CS. In the PCS, each 1-point increase in paternal control the odds of child being in a heavier BMI category decreased by 26%. One study suggested paternal dissatisfaction with own-body size was associated with greater monitoring of son's food intake (but not daughters).	Coercion = Increase	
Ventura and Birch 2008	SR of CS, QES and PCS	Parenting styles, feeding-specific styles, feeding	Children (no specifics) reported	Not reported	Pressure to eat: 10 out of 11 CS, and 1 out of 2 PCS had significant finding for child weight. 6 out of 6 CS, 2 out of 2 PCS and 7 out of 7 QES had significant finding	Pressure to eat = lower BMI over	Confounder adjustments in PCS did not

	Level-I	practices and child BMI or child eating			for child eating. CS consistently support an inverse relationship between parental pressure to eat and child weight. 1 PCS found parent pressure led to lower child weight over time, even after controlling for initial child weight. 2 PCS show parental coercion to eat is associated with higher levels of pickiness and poorer dietary habits across childhood. Restriction: 6 out of 6 CS and 4 out of 5 PCS showed feeding restrictions associate with higher weight status and greater weight gain over time. 2 QES show increased intake of and preference for palatable foods, greater consumption in absence of hunger and higher disinhibition. CS studies show greater restriction of high-sugar foods associated with preference for these foods.	time, pickiness Restriction = Increase	include maternal weight or SES Only one study looked at differences in overt and covert restriction.
Clark, 2007	SR of CS, PCS, RCS and QES Level-I	Parent's knowledge of nutrition, awareness of obesity, child-feeding behaviours and child weight	Preschool and primary school aged children largely in the USA	N=14 in Qual study to 1790 in a CS study	26 studies: 11 CS, 6 PCS, 4 experimental, 2 qualitative and 1 RCS. Evidence is inconsistent and bi-directionality is likely for all behaviours. Restrictive behaviours had best evidence; 9 studies found a positive association between parental restriction (of dietary intake or specific snack foods) and child weight or dietary intake (or both). Four of these studies showed causal relationship whereby restrictive feeding preceded weight gain. Parental feeding strategies can interfere with children's ability to self-regulate their weight.	Restrictive feeding increase risk of high BMI	

Notes:

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2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
3. particularly note if infant, young children, children, young people, adults, older adults, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 2c: Studies used to inform the evidence statement for general parenting and feeding style

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes on quality
Mech, 2016	SR of CS, PCS and mixed method Level-I	Parent-related/socio-ecological factors mediating SES and childhood overweight and obesity association	Children 0-8 years in high income countries, North America (14), Europe (10), Australia (4) and Asia (1)	N=176 to 17,136	30 studies: 15 CS, 12 PCS, 3 mixed-method, 14 of which included parent system factors. Inconclusive evidence for feeding style mediating the SES-Child weight relationship. Four studies investigated the interaction between parenting style, SES and child weight: odds of children being obese increased over threefold with increasing permissive style in high SES families. High income predicted a greater likelihood of permissive parenting style, and permissive parenting style (and long maternal working hours) predicted early and sustained childhood overweight. In low SES other factors (parent's obesity, high stress, maternal depression) were strong risk factors for child obesity	Unclear, suggests permissive parenting in high income families increases risk.	There are only a few studies looking at differences by SES, different measurements of SES
Shloim, 2015	SR of PCS, CS and RCT Level-I	Parenting styles, feeding styles, feeding practices and BMI, obesity or change in weight	Children aged 4-12 years in Australia, USA, Netherlands	n=69 (USA) to n=2596 (Australia)	Parenting style: 3 PCS and 3 CS. Longitudinal studies all showed parenting style significantly associated with child weight. CS mixed findings (possibly due to small sample size unable to detect diff.) Indulgent and uninformed (rejecting or neglectful) styles increased child BMI over time, compared with authoritative and authoritarian. Feeding style: 5 CS, indulgent feeding style associated with higher weight or BMI z-score. When parenting style and feeding style measured in same study,	Indulgent and uninformed (rejecting or neglectful) =increase	Four different parenting style instruments used

					feeding style was associated with child BMI but not general parenting.		
Collins, 2014	SR of CS and PCS Level-IV	Parenting style effect on feeding behaviours (not outcome of diet or body size)	Children and mother (sometimes also father/grandparent), aged 2 to 8 years (mean 4.5 years), US (3), UK (2), Netherlands (1) and Australia (1)	Total: 1845, n=48 to 755 families	6 CS and 1PCS. Six out of 7 identified at least one association between a parenting style and a specific child feeding behaviour. Authoritative parenting and higher scores for warmth were associated with parental monitoring of food intake, absence of pressure to eat or restriction of food and the use of covert food restriction. Authoritarian positively associated with pressuring a child to eat and adopting restrictive child feeding behaviours. Permissive inversely related to monitoring food intake in 3 studies.	Not applicable	
Vollmer and Mobley, 2013	SR of CS, PCS and QES Level-I	Parenting styles, feeding styles and food-specific, activity-specific, weight-specific outcomes, general eating/meal behaviours	Most studies were of middle to high-SES, adolescents (n=18), school aged children (n=17), few preschool studies (n=5)	n=44 to 12,550 parents or families	Parenting style: 31 CS, 8 PCS, 1 QES. Authoritative most protective (F+V, low fat/sugar intake) and associated with lower BMI in PCS, indulgent style consistently associated with negative outcomes. Uninvolved style negatively associated with F+V intake. Feeding style: 11 CS. Indulgent style strongest predictor of high BMI, and assoc with intake of high energy dense foods, SSB, low nutrient dense food, fats.	Indulgent or uninvolved= Increase	10 different standard validated measures to assess parenting style
Fraser, 2011	SR of CS, PCS Level-IV	Paternal parenting style, feeding practices and child weight gain	Father-child dyads in UK (1), US (3) and Australia (1)	N=23 to 4,983	4 studies included measurement of father's parenting style: 1 PCS and 3 CS. Large PCS found strong association with being in overweight/obese BMI category if father was permissive (59% increased risk) or disengaged (35% increased risk) compared with authoritative. Results suggest a warm,	Father authoritative style= protective	Only one PCS

					supportive and firm parenting style may protect against preschool overweight and obesity.		
Sleddens, 2011	SR of CS and PCS Level-I	General parenting style and childhood overweight/obesity, physical activity or diet	Children living in North America (23 studies), Western Europe (9), Australia (3), Asia (3), Southern Europe (2), and Eastern Europe (1)	N=45 to > 4000 parent-child dyads	22 CS, 7 PCS: Children raised in authoritative homes found to eat more healthily, be more active, and have lower BMI. Low controlling style (indulgent) and very strict (authoritarian) are counterproductive, indicating a U-shaped relationship between parental control and child weight. Mixed findings for parenting style associations with breakfast consumption.	Authoritative =protective	21 different instruments used to measure parenting styles
Ventura and Birch, 2008	SR of CS and PCS Level-IV	Parenting styles, feeding-specific styles, feeding practices and child BMI or child eating	Children (no specifics) reported	Not reported	Parenting style: 6 CS (inconsistent), 1 PCS found mothers with more authoritarian, permissive/indulgent or neglectful styles significantly more likely to have children who were overweight 2 years later, compared to authoritative mothers (after adjustment for confounders) Feeding style: 3 CS, children with indulgent parents have higher BMI (directionality is unclear)	Authoritative =protective	Confounder adjustments in PCS did not include maternal weight

Notes:

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2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
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4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 3a: Studies used to inform the evidence statement for parental role modeling

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes on quality
Blissett, 2016	RCT Level-II	The effects of parental physical prompting and role modelling on children's acceptance of a novel fruit (NF)	Birmingham, UK	N=120	Parental modelling is a crucial determinant of the successful introduction of a novel fruit Parental use of physical prompting strategies in combination with modelling of novel fruit intake may facilitate acceptance of the novel fruit, but only in food-responsive children Modelling consumption best promotes novel fruit consumption in children with low food-responsiveness	Protect	?Generalisable
Mazarello Paes, 2015	SR of CS and PCS Level I	The determinants and correlates of sugar sweetened beverage consumption in young children (0-6 years).	Children aged 0-6 years USA x4 Belgium x1 Australia x1 UK x2	Not documented	2 RCT (+ to ++ response to intervention) 1 uncontrolled (++ response to intervention) 1 PCS (++ response to intervention) 4 CS (3 ++ response, 1 – response to intervention. Greater effect of maternal consumption of SSB). Parental modelling of SSB consumption were consistently associated with lower SSB consumption in children, positive parental modelling should be an important component of any SSB intervention	Protect	
Draxten, 2014	RCT Level-II	Associations between parent and child report of parental role modelling Determine whether parental role modelling is associated with children meeting daily F+V recommendations	Minnesota, USA	N=160 8-12 year olds	Parent and child report of parental role modelling F&V was significantly and positively correlated with child F&V, and juice intake Parental role modelling of F&V at snacks – children were more likely to meet daily F&V consumption recommendations Parental role modelling may also increase	Protect	Not SR Lack of validated tool used to capture parental report

Zarnowiecki, 2014	SR of CS Level IV	Whether dietary predictors vary for children of different socioeconomic positions	Children aged 9-13 years	Ranged from 896 to 2529	3 CS and 2 CS from longitudinal data 1 baseline data from longitudinal study Positive associations with SEP were identified for parent modelling in 7 of 10 samples. The association of parent modelling with education was indeterminate overall, but >50% of samples showed a positive association of modelling with education. Observation of mother's food intake and modelling mediated associations of SEP with fruit, vegetable, snack food and fast food intake.	Positive	
Pinard, 2011	SR [add level]	Examine tools used to validly and reliably assess the home environment related to childhood obesity	Children and adolescents USA, Europe, Australia	Range from 184 to 3957	[add types of studies, RCT etc] Caregiver role modelling, support, rules, policies were all significant predictors of dietary intake and PA Caregiver role modelling is a consistent correlate of positive health behaviours in children, not necessarily within the same behaviour domain (i.e. diet or PA) Internal consistencies ranged from moderate to high and test-re-test reliability was high	Protect	The majority of included studies that validate home environment measures did not seek out specific populations that experience obesity at disproportionate rates
Pearson, 2009	SR of CS and PCS Level IV	Family correlates of children and adolescent's breakfast consumption	Children 6-11 years Adolescents 12-18 years European	Children (range from 136-4314) Adolescents (range from 357-18177)	23 CS, 1 PCS Children 6-11years (n=5) Unable to draw conclusion on parent modelling in children and breakfast consumption Adolescents 12-18 years (n=20) Parental breakfast eating was positively associated with adolescent breakfast consumption in 6/7 samples	Adolescents = Protect Children = Unclear	Several studies were not powered to detect significant associations between family correlates and breakfast behaviours
Ventura, 2008	SR of CS and PCS	Influence of parenting on	Children and adolescents	CS range from 180	Longitudinal observations (n=8) supported CS evidence that modelling of intake and	Protect	Variability in defining parenting styles,

	Level-I	children's eating and weight		- 2468 children Experimental Range from 20-39 children	availability of healthy foods predict healthier diets in children over time. Modelling of food intake was associated with lower child weight and energy intake in food secure families. The extent to which parents (mainly mothers) practice healthy eating behaviours and make healthy foods readily available correlates positively with children's level of consumption. Experimental (n=5) data have shown that the presence of a peer or adult model facilitates young children's acceptance of new foods.		constructs and validity of measures Limited generalisability of findings due to populations included
Pearson, 2008	SR of CS Level IV	Associations between the family environment and fruit and vegetable consumption	Children 6-18 years USA and Europe	Range from 36-8263 in children 6-11 years Range from 50-114558 in adolescents 12-18 years	Children 6-11 years: N=7 (fruit/juice), n=10 (vegetables), n=3 (fruit/fruit juice/vegetable) Parental modelling was positively associated with children's fruit (n=5), vegetable (n=5), fruit/fruit juice/vegetable (n=3) consumption, +ve associated with children's fruit juice consumption in n=1, and unrelated to children's fruit (n=2) and vegetable (n=5) consumption. Adolescents 12-18 years: N=1 (fruit/juice), n=10 (vegetables), n=3 (fruit/fruit juice/vegetable) Parental modelling was both positively associated and not associated with adolescent's fruit (n=1) intake, not associated with vegetable (n=1) intake, and positively associated with fruit/fruit juice/vegetable (n=1) consumption.	Children = protect Adolescents = protect and none	
Brown, 2008	SR of CS, RCS, RCT Level-IV	Whether the family environment contribute to food habits and	Children and adolescents from 2 – 17 years 10 USA	Ranged from 92 to 5250	23 CS, 1 RCS, 1 RCT All 23 CS reported association between family modelling and dietary outcomes. 14 CS showed a positive relationship between parental modelling and fruit and vegetable intakes, 3 CS	Positive	

		physical activity in children.	4 UK 9 Europe 2 Australia		with dairy/milk intake, 2 CS with low fat eating patterns and 1CS assessed eating, snacks, and breakfast intakes.		
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Notes:

1. type [systematic review (SR) may include meta-analysis (MA), randomised controlled trial or randomised cross-over trials (RCT), non-randomised and quasi-experimental studies (QES), prospective and retrospective cohort studies (PCS, RCS), case series, case reports, case-control and cross-sectional studies (CS), qualitative studies (QUAL)] with level of evidence.
2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
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4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 3b: Studies used to inform the evidence statement for teacher role modeling

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes on quality
Ward, 2015	SR of RCT, QES and CS Level-III	Predictors or effectiveness of childcare educator's practices on pre-schoolers' healthy eating and physical activity behaviours	Primarily African American, Latino, Hispanic children	Range from 19 to 275 pre-school children	4 QES, 1 RCT, 1 CS focused on nutrition: All 5 papers reported positive changes in children's eating behaviours when educators used recommended mealtime practices. 1 mod quality QES found increased new food intake when using non-food rewards, encouraged to 'try one bite' and allow self-selection. Another mod quality QES showed increased intake with healthy eating modelled enthusiastically, but when adjusted for peer modelling, was no longer observed. 2 low-quality QES found increased intake of healthy snacks when allowed to self-serve, and increased vegetable intake when given immediate positive verbal reinforcement and non-food rewards. 1 low-qual RCT found increased fruit and veg intake with self-serving, or when fruits/vegetables served in advance, though this was in a primarily African-American population.	Weak evidence that educator practices positively influence pre-schoolers' eating behaviours	Low number of high quality intervention studies Only one study specified SES and one reported ethnicity – both important as lower SES and certain ethnicities have been linked to poorer quality diets. Lack of consideration to demographic differences Did not report on whether the nutrition related data collection tools were valid

					2 QES found that silent modelling may not be enough to increase children's intake or acceptance of new foods		
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Notes:

1. type [systematic review (SR) may include meta-analysis (MA), randomised controlled trial or randomised cross-over trials (RCT), non-randomised and quasi-experimental studies (QES), prospective and retrospective cohort studies (PCS, RCS), case series, case reports, case-control and cross-sectional studies (CS), qualitative studies (QUAL)] with level of evidence.
2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
3. particularly note if **infant, young children, children, young people, adults, older adults**, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 4a: Studies used to inform the evidence statement for responsive feeding for infants and young children

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes on quality
Magarey, 2016	RCT, 3.5 year follow up Level-II	NOURISH Trial early feeding intervention, teaching responsive feeding that recognise and respond to child cues of hunger and satiety, and healthy food promotion Control group access to usual child health services	Healthy term infants in Brisbane and Adelaide 4 months	(352 intervention and 346 in control) At 5 years of age N= 213 intervention and N= 211 control	Improvements in dietary outcomes and child eating behaviours at 3.5 years post intervention	Protect	60% retention of sample at 5years
Hurley, 2015	SR of CS, QES, PCS Level-I (infants and toddlers) Level-IV other ages	Responsive feeding and child obesity in high-income countries.	Infants & young toddlers; toddlers & pre-schoolers; pre-schoolers and early elementary school. 22 US, 7 UK 1 Australia, 1 France/US	Range from N =15 to N =1790	25 CS, 1 QES, and 3 PCS Non-responsive feeding is associated with child BMI or overweight and obesity.	Increase	3 age groups and only 4 studies in infants and young toddlers 3 (PCS) and 1 (CS)

DiSantis, 2011	SR Level-I	The role of responsive feeding in overweight during infancy and toddlerhood.	0-24 months	Range from N=10 to N= 1896	1 RCT, 3 CS, 5 PCS: Preliminary support for the proposed role of discordant responsiveness in infant/child overweight	Increase	Studies used Inconsistent definitions and measures of responsiveness.
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Notes:

1. type [systematic review (SR) may include meta-analysis (MA), randomised controlled trial or randomised cross-over trials (RCT), non-randomised and quasi-experimental studies (QES), prospective and retrospective cohort studies (PCS, RCS), case series, case reports, case-control and cross-sectional studies (CS), qualitative studies (QUAL)] with level of evidence.
2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
3. particularly note if infant, young children, children, young people, adults, older adults, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 4b: Studies used to inform the evidence statement for limiting distractions while eating

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes on quality
Marsh, 2013	SR of RCT and QES Level-I	Non-advertising effects of screens (largely TV) in children and young people Four trials assessed effects of video-games None investigated computer use	5-24 year olds. High income populations (France, Denmark, USA, Canada and Australia)	Range from N=120 to N=14	8 RCTs (risk of study bias from low to high) and 2 QES Screen time in the absence of food advertising increases intake of highly palatable, energy-dense foods, most likely through distraction	Increase	
Chapman, 2012	SR of RCT and QES plus a MA, Level-I	Lifestyle determinants of the drive to eat	Adults - 8 television studies, 5 sleep studies and 10 alcohol studies	Not reported	23 RCT or QES TV watching, alcohol intake and sleep deprivation had significant short-term effects on food intake with alcohol being most significant then sleep deprivation and television watching.	Increase	

Notes:

1. type [systematic review (SR) may include meta-analysis (MA), randomised controlled trial or randomised cross-over trials (RCT), non-randomised and quasi-experimental studies (QES), prospective and retrospective cohort studies (PCS, RCS), case series, case reports, case-control and cross-sectional studies (CS), qualitative studies (QUAL)] with level of evidence.
2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
3. particularly note if infant, young children, children, young people, adults, older adults, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)

5. None, Increase or Protective

Table 4c: Studies used to inform the evidence statement for responsive eating

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes on quality
Daubmenmier, 2016	RCT Level-II	Effects of mindfulness-based weight loss intervention in adults with obesity Intervention 5.5 months diet-exercise intervention with or without mindfulness component.	Adults BMI between 30 and 45.9 (waist circumference >102 cm for men; >88cm for women)	N= 194	Mindfulness in addition to a diet-exercise programme did not show a substantial weight loss benefit.	None	
Schaefer, 2014	SR of RCT, QES and PCS Level-I	Review of Interventions that promote eating by internal cues.	Overweight or obese women and men	Range from N=10 to N=357	9 RCTs, 2 QES and 9 PCS Eating intuitively helped participants abandon unhealthy weight control behaviours, improve metabolic fitness, increase body satisfaction and improve psychological distress.	Protective	Inconsistent definitions of non-diet approaches and use of different instruments for measuring outcomes
Katterman, 2014	SR of RCTs Level-I	Mindfulness meditation an intervention for binge eating, emotional eating and weight loss	Overweight obese women and men	Range from N=10 to N=108	14 RCTs Mindfulness meditation effectively decreases binge eating and emotional eating in populations engaging in this behaviour; evidence for its effect on weight is mixed.	Protective	Inconsistent definitions of non-diet approaches and use of different instruments for measuring outcomes
Clifford, 2014	SR of RCT and QES Level-I	Impact of Non-Diet approaches on attitudes, behaviours and health outcomes <u>Non-Diet Approaches:</u> Mindfulness Healthy eating at any size Eating competence Intuitive Eating	Adult males and females Predominantly overweight and obese	Range from N= 26 to N= 1,689	14 RCTs and 2 QES Non-diet interventions resulted in statistically significant improvements in disordered eating patterns, self-esteem and depression.	Protective	Inconsistent definitions of non-diet approaches and use of different instruments for measuring outcomes.

Robinson, 2013	SR of RCTs and MA Level-I	Eating attentively – the effect of food intake memory and awareness on eating <u>Attentive interventions:</u> Decreasing awareness on immediate food intake Increased attention on immediate intake Enhancing memory on later intake Distraction on immediate versus later intake	Adult female and males. Predominantly university students	Range from N= 14 to N= 122	24 RCTs Attentive eating is likely to influence food intake. Reducing attention via distraction during eating may increase immediate intake – small effect size Enhancing memory for food consumed decreases later intake – medium effect size Reducing awareness of food consumed increases immediate food intake – larger effect size	Protective	Inconsistent definitions of non-diet approaches and use of different instruments for measuring outcomes
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Notes:

1. type [systematic review (SR) may include meta-analysis (MA), randomised controlled trial or randomised cross-over trials (RCT), non-randomised and quasi-experimental studies (QES), prospective and retrospective cohort studies (PCS, RCS), case series, case reports, case-control and cross-sectional studies (CS), qualitative studies (QUAL)] with level of evidence.
2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
3. particularly note if infant, young children, children, young people, adults, older adults, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 5a: Studies used to inform evidence statement for eating and/or skipping breakfast

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants /Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes
Brown, 2013	SR of RCT, review of previous SRs and MA of CS Level-I	Breakfast eating or skipping with BMI, overweight, obesity	Not reported	Not reported for CS RCT n=10-52 adults	Presumption that eating breakfast protects against obesity is based on a (very strong) association which is only found in CS 8 RCT included in review were not consistent, only 3 of which were specifically breakfast compared with no breakfast	None, Unclear	RCTs often specific breakfast foods rather than no breakfast

Mesas, 2012	SR of CS and PCS Level-I (adults) and Level-IV (children)	Skipping breakfast with overweight, obesity, BMI	Mostly children and adolescents (48 studies) Child PCS all in USA Adult PCS in Japanese men and US men	Range from 80 to 31,228 in children and adolescents. Range from 117 to 34,974 in adults	Children/adolescents: 48 CS found an association even when adjusting for confounding in 14 of studies, but 7 PCS obtained heterogeneous results (2 positive, but those studies did not adjust for confounders of activity and energy intake, and 5 found no association after adjustment). 2 of the PCS found an association between skipping breakfast and BMI only if overweight at baseline. Adults: 13 CS (8 positive, 6 of which had good adjustment for confounding, but 5 no association, 2 of which had good adjustments) and 2 PCS both showed positive assoc. with body weight (>5% increase in BMI after 1 year follow up, and 5kg gain over a 10-year follow-up) with good adjustment for confounders.	Unclear in children, possibly eating breakfast protects against weight gain in adults	High quality PCS in men.
Horikawa, 2011	SR with MA of CS Level-IV	Breakfast skipping (>1 a week) with overweight, obesity, body weight, BMI	Mostly children and adolescents (15 of 19 studies); 6 in developed countries; 15 in developing countries (all Asia and Oceania). 28 datasets in MA (gender and age group separated)	92,108 when pooled in MA (range 123 to 68,606)	19 CS included Pooled OR of 1.75 (95%CI 1.57,1.95) for breakfast skipping. No differences by age, region, gender. Only one study reported non-significant association, possibly due to small sample size (n=125).	Protect	Largest studies included in meta-analysis where from China (n=68,606) and Japan (n=5,753) Four studies used self-reported weight. Different definitions of breakfast skipping.
Szajewska and Ruszczynski, 2010	SR with MA of CS Level-IV	Breakfast skipping with BMI, overweight, obesity	Children and adolescents in Europe	2,086 in MA 57,481 when pooled (range 328 to 25,176)	16 CS included in total review (4 in MA, rest descriptive) consistently show children and adolescents who eat breakfast have a reduced risk of overweight/obesity and lower BMI	Protect	No consistent definition of breakfast consumption. Confounding between breakfast eating and healthy diet and lifestyle

					Mean BMI increase of 0.78 kg.m ² in breakfast skippers compared with breakfast eaters.		often not accounted for in CS.
Quigley, 2007	SR of CS and PCS Level-I	Breakfast consumption with body size and food/nutrient intake	Children and adolescents, mostly US, Northern European, and one NZ (CS)	PCS n=652, 2379, and >14,000 CS range from n=1493 to 24,004	5 PCS and 14 CS on body size included (consistently found to be protective in CS, but mixed results in PCS) 10 CS, 1 PCS and 1 RCT on nutrient intake. Found energy intake higher in breakfast eaters in 4 out of 6 studies (similar energy intake in other 2 studies), higher mineral, vitamin, and better macronutrient intakes in breakfast eaters.	Protect in CS but unclear in PCS	Also contains review of studies looking at cognitive outcomes. Strong Level-I evidence that consuming breakfast is associated with improvements in academic performance.

Notes:

1. type [systematic review (SR) may include meta-analysis (MA), randomised controlled trial or randomised cross-over trials (RCT), non-randomised and quasi-experimental studies (QES), prospective and retrospective cohort studies (PCS, RCS), case series, case reports, case-control and cross-sectional studies (CS), qualitative studies (QUAL)] with level of evidence.
2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
3. particularly note if infant, young children, children, young people, adults, older adults, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 5b: Studies used to inform evidence statement for frequency of eating occasions per day

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes
Raynor, 2015	SR of RCT and QES Level-I	Eating frequency with weight, BMI	Adults (5 studies in laboratories, 4 studies in the field)	RCT range from n=8-15 QES from 6-12	5 RCT and 4 QES reported body weight/BMI outcomes. 3 RCT and all QES found no significant effect of EF.	Unclear – most likely none	Very small samples in all trials
Schoenfeld, 2015	SR of RCT with MA Level-I	Eating frequency with weight loss and body composition (BMI, fat-free mass and % body fat)	Adults (healthy, largely sedentary)	Not reported	15 RCT included in MA, found increased eating frequency appeared to be positively associated with reductions in fat free mass and body fat %. However sensitivity analysis showed this was largely the result of one trial. Small difference in the magnitude of effect between number	None	Initial positive effect of greater EF on weight loss could be explained by variances in total daily energy intake (needed to control for this) and undue weighting in MA

					of eating occasions per day suggest limited practical significance.		of a single study of boxers (Iwao, 1996)
Kant, 2014	SR of RCT, QES and PCS Level-I	Eating frequency with weight management (change in BMI, weight gain)	Healthy children, adolescents and adults, mostly USA	PCS n=7147 adults, 20064 men, 101 girls and 2372 girls RCT range from 8 to 100 QES n=6	4 PCS: 1 in adults found no relationship over 10 year follow-up with adjustment for activity and total energy intake, 1 in men found incr risk of weight gain over >5kg over 10 yr adjusting for activity but not intake. Large PCS in girls found less than 6 eating occasions a day associated with increased BMI at 10 years of followup. 7 RCT and 2 QES (adults) found no independent relationship.	None	
Kaisari, 2013	SR of CS with MA Level-IV	Eating frequency with weight, BMI	Children and adolescents (aged 2-19yrs) from US, Europe, Brazil	18,849 pooled	11 studies included in MA (21 datapoints) Children and adolescents with higher number of eating episodes per day had 22% lower probabilities of being overweight or obese (significant assoc. in boys, not girls)	Protect	Variability in definitions of EF and body size, and confounders used.
Mesas, 2012	SR of PCS and CS Level-I (adults) and Level-IV (children)	Eating frequency (meals and snacks) with body size	Children and adolescents, and adults	Range from 226 to 5811 in children and adolescents, range from 239 to 19,478 in adults	8 PCS and 31 CS studies included 14 CS in children showed heterogeneous results, however the 5 of these with the best adjustment for confounders found protective effect. Three good quality PCS found eating at least 3 times/day predicted lower BMI. In adults, 7 of the 9 CS studies with good adjustment for confounders reported an inverse association. One of the 2 PCS found no association after 8 years follow up, the other an increased risk of gaining 5kg+ over 10 years with >4 eating occasions per day.	Possibly protect in children, unclear in adults	

Koletzko and Toschke, 2010	SR of CS Level-IV	Meal frequency with overweight and obesity	Children from Germany, USA and Portugal	13,998 pooled	5 studies (all CS but 1 also had 5-yr longitudinal data) all good quality Children with 5 or more meals a day lower risk of overweight or obese	Protect	
Palmer, 2009	SR of RCT Level-I	Eating frequency (meal, snack) with weight loss or weight maintenance	Adults in US, UK, Canada and Europe	Range from 10 to 140	10 weight loss studies included (7 RCT) – all no relationship with weight loss 15 weight maintenance studies included (8 RCT) – 3 reported significant but small fluctuations in weight by EF over 8, 4 and 2 weeks respectively, no relationship with weight in other studies	None	Short durations

Notes:

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2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
3. particularly note if infant, young children, children, young people, adults, older adults, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 5c: Studies used to inform evidence statement for family meals (families eating together)

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes
Dietary Guidelines Assessing Committee, 2016	SR of PCS Level-I	Number of family meals with improved dietary intake	Children aged 12 followed for 5 years and aged 15 followed for 10 years (both genders), USA	n=674 and 2,052 respectively	Two PCS found regular family meals during transition from early to middle adolescence, and in young adulthood, improved diet quality.	Unclear but likely to protect	
Dietary Guidelines Assessing Committee, 2016	SR of RCT, PCS Level-I	Family-shared meals and body weight	RCT: 4 year olds PCS: 5-15 year olds followed for 1-5 years Ethnically diverse	RCT: 121 parent-child dyads USA PCS n=2516 to 14431, all USA	1 RCT (6 month home-based intervention to improve household routines – no improvement in number of shared meals, even though	Mixed, unlikely to protect	No studies described quality of food eaten during family meals

					reduction in BMI) and 5 PCS with mixed findings		
Valdes, 2013	SR of CS and PCS Level-I	Frquency of family meals (FFM) with childhood and adolescent overweight	Children aged 4 to 17 years, 11 studies in North America, 2 in Australisia, 1 in Japan, 1 in Korea. PCS all in USA.	Range of n= 139 to 14,431	Six out of 11 CS and one of the 4 PCS found statistically significant inverse association between FFM and being overweight (OR ranging from 0.11 to 0.93), stronger in younger children (4-7 year olds). PCS with 5 year follow up and best adjustment for confounders did not find an association.	Unclear in PCS	Only one PCS measured height and weight. Most studies did not adequately adjust for confounders and used different definitions.
Hammons and Fiese, 2012	SR with MA of PCS and CS Level-I	3+ and 5+ family meals a week versus 1 or none with obesity, and unhealthy diet.	Children and adolscents (range of mean age 2.8-17.3 years) 12 studies from US, 1 Finland, Japan, NZ, Australia, Canada	n=182,836 pooled (range of n=145 to 99,462)	17 studies included in review and MA, showed 20% decrease in odds of eating unhealthy foods, 24% increase in odds of eating healthy foods if 3+ family meals per week, larger effect in older children than younger. 8 CS (4 no association in adolescents, significant OR when pooled of 12% less likely to be overweight when 3+ family meals a week, 25% less likely when 5+ family meals per week) and 4 PCS (significant OR when pooled of 7% reduction of overweight)	Protect	Different definitions of family meals (just dinner in some, breakfasts and dinners in others) plus who is present often missing. Only some confounders adjusted for in studies
Berge, 2009	SR of CS and PCS Level-I (9-21 years) Level-IV (younger children)	Family meals with weight and diet, dieting and disordered eating	Children (5-12 years) and adolescents (9-21 years) separately considered	Range reported in appendix table	Children: 4 CS showed FFM associate with healthful diet (more veg/fruit, less friend food and soda, less saturated/trans- fat) Adolescents (11-18 years): 10 CS, 9 by same research group. All found positive associations with better diet and negative association with dieting. 5 PCS (9-21 years with diverse popns) FFM reduced OR of being overweight one and 3 years later, predicted higher intakes of healthy diet, breakfast (in girls), and higher priority for meal	Protect	

					structure and social eating in young adulthood. Plus protective against dieting and disordered eating in young adult females.		
Woodruff and Hanning, 2008	SR of CS studies Level-IV	FFM and dietary intake	Adolescents (13-19 years)	N=171 to 18,177	7 CS studies, appraised for strength of evidence and plausibility and rated as weak(n=0), moderate (n=4) or strong (n=3). Found positive association of FFM with intakes of fruits, vegetables, dairy, vitamins and minerals, fibre and negative association with SSB.	Protect	Data collection method usually self-report from adolescent respondent

Notes:

1. type [systematic review (SR) may include meta-analysis (MA), randomised controlled trial or randomised cross-over trials (RCT), non-randomised and quasi-experimental studies (QES), prospective and retrospective cohort studies (PCS, RCS), case series, case reports, case-control and cross-sectional studies (CS), qualitative studies (QUAL)] with level of evidence.
2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
3. particularly note if infant, young children, children, young people, adults, older adults, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 6a: Studies used to inform the evidence statement for food preparation and cooking skills

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Pop ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes on quality
Schembri, 2016	SR of QES, CR and RCT Level-III	Nutrition education on nutrition-related health outcomes including BMI	Aboriginal and Torres Strait Islander people in Australia, remote location and urban, aged 40-51 years	N=13-100	6 studies (1 CT, 4 case series with pre- and post-test, 1 pragmatic RCT) 3 studies reported a mean decrease in BMI. Components of nutrition education interventions that had the greatest impact on BMI decrease included cooking skills workshops, group education sessions and store interventions (such as tours and shelf talkers (labels on shelves identifying	Protect	Four of the six studies rated as moderate to weak quality – lack of blinding within study designs and lack of statistical analysis.

					healthy options and encouraging switch to a healthier option).		
Dudley, 2015	SR of QES and CT Level-III	Teaching approaches and strategies that promote healthy eating: reduced food consumption or energy intake, fruit/veg consumption or preference, reduced sugar consumption, increased nutritional knowledge	Primary school aged children from 13 different countries in OECD. More than half in the USA, 7 in UK.	N=115-590	49 studies in total, six of which included food preparation/cooking (2 QES, 4 CT) Curriculum-based approaches alone are not the best influence. Experiential learning approaches (gardening, cooking and food prep) had greatest effect – 2 studies reporting statistically significant reduction in reducing food consumption/energy intake and increasing nutritional knowledge. Smaller but positive effect also on fruit and veg consumption and preference. Cross-curricula and enhanced curricula approaches were also helpful.	Protect if experiential learning approach	
McGowan, 2015	SR of QES, CS and QUAL Level-III	Domestic cooking skills and food skills with fruit and vegetable intake, dietary quality	Adults living in Western countries (8 in UK, 4 in Europe, 9 in the USA, 3 in Canada, 2 in Australia)	N=80-5553 in CS (8 of 11 CS had more than 700) and n=19-602 in intervention studies	11 CS, 11 QES and 4 QUAL Limited dietary changes resulting from existing intervention studies, however, increasingly comprehensive approaches (improving both cooking skills and food skills such as in JMoF) show promise. Need to also address psychological components (attitudes) and external barriers, particularly in socioeconomic deprived communities.	Possibly protect if comprehensive approach to improving both cooking and food skills	Few measures used in studies captured all aspects of cooking and food skills – instrument devised by Barton et al (2011) shows promise
Vaitkeviciute, 2014	SR of CS, QES, PCS Level-III	Food literacy (includes nutrition knowledge, but also skills and behaviours of being able to select and prepare food in ways that meet the nutrition guidelines) on dietary intake	Adolescents (aged 10-19 years), 6 in USA, 4 in Europe, 1 in Australia, 1 in Middle East, 1 in Sth Africa.	N=72 to 7669	10 CS, 2 QES, 1 PCS Food literacy may play a role in shaping youth eating behaviours, and skills/behaviours learned in adolescence are sustained later in life.	Possibly protective	Many problems with study quality, tools for collecting data and measuring aspects of food literacy. No one study included all

							aspects of food literacy (not holistic).
Hersch, 2014	SR of RCT and QES Level-I	Cooking classes in school on changes in food-related preferences, attitudes and behaviours	School-aged children (5-12 years old)	N=44 to 671	6 QES (1 strong, 3 moderate and 2 weak quality rating) and 2 RCT (1 weak and 1 strong quality rating) Every programme had a significant short term effect on one or more food-related preferences, attitudes and behaviours. Children's willingness to try foods increased after cooking interventions and consumption increased.	Protect but unclear if long-term effect	Varying length of intervention from 2 months to 2 years with diverse outcomes Only two studies with physical measures, predominantly self-report F+V intake
Reicks, 2014	SR of RCT and CT Level-I	Home food preparation and cooking intervention on diet-related health outcomes	Adults (several targeted parents)	N=46 to 739	6 RCT, 6 CT, 16 QES (no control) 16/19 reported beneficial changes to dietary intake 3/3 reported improved understanding of health food prep and healthier cooking strategies. 4 reported positive health outcomes (e.g. lower cholesterol) but no change to BMI. Primary barriers were family food norms/preferences and resistance to change, as well as financial constraints.	Unclear – some positive findings but lack of evidence	Many different study designs. Only 15 of the 28 studies had long-term followup. Community programmes almost certainly have self-selection bias and many did not include those not interested in learning to cook
Iacovou, 2012	SR of CS, QUAL Level-IV	Community kitchens effect on social health and nutrition outcomes	Low-income adults, mostly parents, in Canada, Scotland and Australia	Small (n=6 to 93)	8 QUAL, 1 CS, 1 QES (mixed-method) Community kitchens (CK) may enhance cooking skills and improve social interactions and nutritional intake of participants. Income-related food insecurity ultimately requires other solutions, but CK provide nutritious food and skills in the short term. CK improve participants' dignity by	Unclear but possibly protective	Lack of evidence for causal effect Inconsistent and weak data collection methods

					reducing need for other charitable food sources.		
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Notes:

1. type [systematic review (SR) may include meta-analysis (MA), randomised controlled trial or randomised cross-over trials (RCT), non-randomised and quasi-experimental studies (QES), prospective and retrospective cohort studies (PCS, RCS), case series, case reports, case-control and cross-sectional studies (CS), qualitative studies (QUAL)] with level of evidence.
2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.
3. particularly note if infant, young children, children, young people, adults, older adults, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective

Table 6b: Studies used to inform the evidence statement for gardening

Reference (author, yr)	Study type ¹	Intervention/comparator ²	Participants/Popn ³	N	Results/Outcome ⁴	Effect on risk ⁵	Notes on quality
Ohly, 2016	SR of RCT, CT, QUAL Level-I	School gardens, reporting quant or qual health and wellbeing outcomes, including dietary intake, food-related knowledge, attitudes and preferences.	School-aged children up to 18 years from UK, Portugal, USA and Australia	N=12 to 1391	5 RCT (1 mod quality, 4 weak), 13 cluster CT (3 mod quality), 16 QUAL, 3 mixed-method. Some quant evidence for nutritional impacts of increased preference for and consumption of fruits and vegetables. Qual synthesis provides contextual information about how school gardens lead to health and wellbeing improvements – used to build a conceptual model. Gardening can be integrated into the wider curriculum to maximise opportunities for learning. Appear to have particular benefit for students with complex needs (behavioural, emotional or educational) – average popn outcomes can obscure this.	Protect but poor quality quant data	Most studies relied on self-reported outcome data, likely to be affected by social desirability bias.
Dudley, 2105	SR Level-III	Teaching approaches and strategies that promote healthy eating: reduced food consumption or energy intake, fruit/veg consumption or	Primary school aged children from 13 different countries in OECD. More than half in the USA, 7 in UK.	N=115-590	49 studies in total, 4 of which specifically used school gardens (1 CT, 3 QES) Curriculum-based approaches alone are not the best influence. Experiential learning approaches (gardening, cooking and food prep) had greatest effect – 2 studies	Protect if experiential learning approach	

		preference, reduced sugar consumption, increased nutritional knowledge			reporting statistically significant reduction in reducing food consumption/energy intake and increasing nutritional knowledge. Smaller but positive effect also on fruit and veg consumption and preference. Cross-curricula and enhanced curricula approaches were also helpful.		
Langellotto and Gupta 2012	SR and MA Level-III	Gardening effect on nutrition knowledge, preferences for fruit and or vegetables, consumption of fruit and or vegetables.	Children from Kindergarten to Grade 12 in USA	Not reported	20 QES (most included control, but not randomised). Participating in nutrition education programmes lead to increase in nutritional knowledge. However, increased preference and consumption were primarily documented in the gardening programmes. Gardening increased vegetable consumption, whereas the impacts of nutrition education programmes were marginal or non-significant. Hypothesis to explain results: gardening increases access and decreases reluctance to try new foods.	Protect	Small effect sizes and low fail-safe numbers in the meta-analyses, indicating need for more studies to be confident in findings.
Robinson-O'Brien, 2009	SR of CT, QES and QUAL Level-III	Garden-based nutrition education on fruit and/or vegetable intake, willingness to taste fruits and vegetables, preferences for fruits and vegetables, and other nutrition-related outcomes	5-15 year olds in USA 5 interventions were school-based, 3 after-school and 3 community-based	N=38-213	11 studies: 5 CT (3 compared gardening with standard nutrition education alone), 5 QES, 1 QUAL Garden-based nutrition-education programmes may have the potential to lead to improvements in fruit and veg intake, willingness to taste fruit and veg and increased preferences for fruit and veg when these are low among youth. However, difficult to make conclusions based on limited evidence.	Possibly protective	Usually convenience samples with limited follow-up (6 months was longest)

Notes:

1. type [systematic review (SR) may include meta-analysis (MA), randomised controlled trial or randomised cross-over trials (RCT), non-randomised and quasi-experimental studies (QES), prospective and retrospective cohort studies (PCS, RCS), case series, case reports, case-control and cross-sectional studies (CS), qualitative studies (QUAL)] with level of evidence.
2. include definitions and outcome of interest: diet*(intake, patterns, quality), fruit/veg intake, body size, BMI, weight, weight gain, weight maintenance, weight loss, overweight, obesity.

3. particularly note if infant, young children, children, young people, adults, older adults, Māori, Pasifika, families, low-income, and the country/region
4. Include assessment of whether effect is real, rather than due to chance (using a level of significance expressed as a P-value and/or a confidence interval)
5. None, Increase or Protective