



Review Article

Enablers and barriers to implementation of and compliance with school-based healthy food and beverage policies: a systematic literature review and meta-synthesis

R. Ronto^{1,*}, N. Rathi² , A. Worsley³, T. Sanders⁴, C. Lonsdale³ and L. Wolfenden^{5,6}

¹Department of Health Systems and Populations, Faculty of Medicine, Health and Human Sciences, Macquarie University, NSW 2109, Australia: ²Department of Humanities and Social Sciences, Indian Institute of Technology Bombay, Mumbai 400076, India: ³School of Exercise and Nutrition Sciences, Institute for Physical Activity and Nutrition, Deakin University, VIC 3220, Australia: ⁴Faculty of Health Sciences, Institute for Positive Psychology and Education, Australian Catholic University, NSW 2060, Australia: ⁵Hunter New England Population Health, Wallsend, NSW 2287, Australia: ⁶School of Medicine and Public Health, University of Newcastle, NSW 2308, Australia

Submitted 26 February 2019: Final revision received 14 August 2019: Accepted 20 November 2019: First published online 22 April 2020

Abstract

Objective: Schools have been recognised as a potential setting for improving young peoples' food and beverage choices; however, many schools fail to adhere to healthy food and beverage policy standards. The current study aimed to explore the enablers and barriers to effective implementation of and compliance with school-based food and beverage policies.

Design: Systematic review and meta-synthesis. Eight electronic databases were searched for articles in June 2019. Studies were eligible for inclusion if they reported on implementation and/or compliance of school-based food and/or beverage policies with outcomes relating to enablers and/or barriers. This review had no restrictions on study design, year of publication or language. Seventy-two full-text articles were assessed for eligibility, of which twenty-eight were included in this review.

Setting: Studies conducted globally that focused on schools.

Participants: School-based healthy food and beverage policies.

Results: Financial (cost of policy-compliant foods, decreased profit and revenue), physical (availability of policy-compliant foods, close geographical proximity to unhealthy food outlets) and social (poor knowledge, understanding, and negative stakeholders' attitudes towards policy) factors were the most frequently reported barriers for policy implementation. Sufficient funding, effective policy communication and management, and positive stakeholders' attitudes were the most frequently reported enablers for policy implementation.

Conclusions: There is a need for better communication strategies, financial and social support prior to school-based food policy implementation. Findings of this review contribute to a thorough understanding of factors that underpin best practice recommendations for the implementation of school-based food policy, and inform those responsible for improving public health nutrition.

Keywords
Schools
Policies
Implementation
Food environment

Over the last few decades, childhood obesity has increased dramatically, posing a major public health challenge globally^(1,2). Overweight and obesity has been identified as a major contributing factor to the development of non-communicable diseases, such as CVD and type 2 diabetes^(2,3). All these life-threatening conditions pose

severe threats not only to individual health but also to the economic wellbeing of wider society^(4,5). Unhealthy dietary behaviours have been identified as the leading contributor to overweight and obesity⁽⁶⁾. Indeed, children's unhealthy dietary behaviours^(7–9) may lead to weight gain and an increased risk of overweight and obesity⁽¹⁰⁾. Most

*Corresponding author: Email rimante.ronto@mq.edu.au





importantly, unhealthy dietary behaviours that develop during childhood and adolescence often continue into adulthood⁽¹¹⁾. Food environments have been identified as a major contributor to unhealthy dietary patterns⁽¹²⁾.

Swinburn *et al.*⁽¹³⁾ categorised food environments into physical (*what is available?*), economic (*what are the financial factors?*), political (*what are the rules?*) and socio-cultural (*what are the attitudes, beliefs, perceptions and values?*). Globally, health professionals and policymakers have recognised schools as a potential setting for improving young peoples' dietary quality through policy implementation^(14,15). Young people consume over one-third of their daily energy intake at schools^(16–18). Therefore, the food environment at schools, including what food schools offer (e.g. via canteen or vending machine), can have a significant impact on children's dietary behaviours⁽¹⁹⁾. Disappointingly, research indicates that food environments at schools often encourage unhealthy dietary behaviours among students^(20–22). This criticism is mainly attributed to the widespread promotion (e.g. in-school marketing, product placement), availability of and accessibility to unhealthy foods and beverages (e.g. french-fries, chicken nuggets, sugar-sweetened beverages)^(23–25) and limited provision of healthy foods (e.g. fruit or vegetable salad) at schools⁽²⁰⁾.

On a daily basis, students need to navigate through complex food environments to make food-related decisions that are often automatic or subconscious⁽²⁶⁾. Therefore, it is important to provide a healthy food environment to help students make healthy food choices. A crucial component of the food environment at school is the food and beverage policy^(15,27) that has been implemented in many countries⁽¹⁵⁾, for example, the United States⁽²⁸⁾, Australia⁽²³⁾ and the United Kingdom⁽²⁹⁾. Such policies primarily focus on improving students' food consumption through modifications to the food environment at school^(14,23). These policies can include the provision of nutritious food that meet comprehensive and consistent nutrient-based standards, alterations to the presentation of foods at the point-of-sale, and marketing restrictions^(14,23,28). Objective audits, however, suggest that many schools fail to implement or adhere to healthy food and beverage policy standards^(30,31). This failure highlights the need to understand the enablers and barriers to effective implementation of and compliance with school-based food and beverage policies^(24,32). No review has been published so far that systematically synthesised the evidence on enablers and barriers to school-based food policy implementation. Therefore, the aim of this systematic literature review and meta-synthesis was to explore and synthesise these enablers and barriers.

Methods

Study design

Reporting of this review is in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses

guidelines⁽³³⁾. The protocol for this review prospectively was registered with PROSPERO (registration number CRD42017078940). No major changes were made to the original protocol submitted.

Search strategy

A search strategy was developed by the research team in consultation with a research librarian at the Australian Catholic University. The research question was developed using the Population Intervention Comparison Outcome framework⁽³⁴⁾: what are the enablers and barriers (O) to implementation of and compliance with healthy food and beverage policies (I) in schools (P)? A comprehensive literature search was carried out in June 2019 with eight electronic databases: Medline (EBSCO Host), Scopus, Cochrane Library, PubMed, Web of Science, Embase, SocINDEX and Business Source Complete. These databases afford a broad coverage of nutrition and public health literature. The search terms and strings used in the systematic review and meta-synthesis are outlined in Table 1.

Study selection

Two reviewers conducted an initial search for relevant studies. We extracted studies identified via the search to an EndNote version 8 (Thomson Reuters 2017) reference library. Duplicates were automatically identified and removed. Two reviewers independently screened each abstract to identify studies that potentially met the eligibility criteria. Then, two reviewers retrieved and independently screened full-text articles against the inclusion and exclusion criteria. Disagreements were resolved through a discussion and consultation with a third reviewer. Two reviewers screened the reference lists of included studies to identify any additional studies. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram⁽³³⁾ was used to document the number of articles at each screening stage (Fig. 1).

Inclusion and exclusion criteria

Studies were eligible for inclusion if they reported on implementation and/or compliance of food and/or

Table 1 Search terms and strings used in literature review and meta-synthesis

Number	Search terms and string
1	Health* OR nutriti* OR wellness OR 'health promotion'
2	Food OR diet OR nutrition OR eating OR meal* OR nourish*
3	Beverage* OR drink*
4	Policy* OR guideline* OR regulati* OR criteria OR standard* OR strateg*
5	School* OR education*
6	Enabl* OR barrier* OR facilitator* OR lesson*
7	2 OR 3
8	1 AND 4 AND 5 AND 6 AND 7

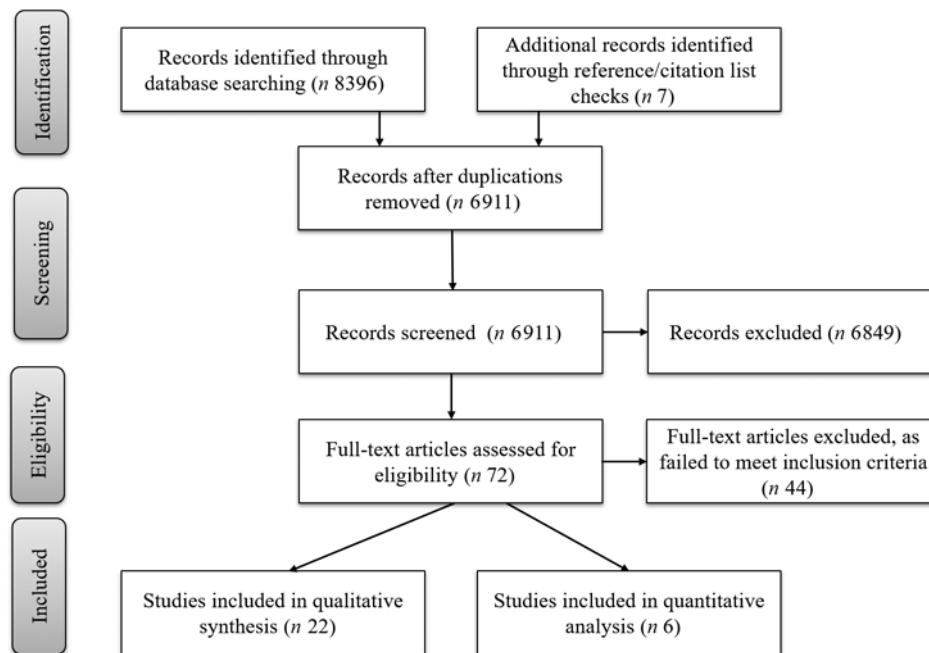


Fig. 1 Flowchart of the literature search and review process

beverage policies in school settings, including primary and secondary schools, with outcomes relating to enablers and/or barriers. For this review, an enabler was defined as ‘a person or thing that makes something possible’; a barrier was defined as ‘a circumstance or obstacle that keeps people or things apart or prevents communication or progress’⁽³⁵⁾; policy implementation was defined as ‘putting into place new policies and procedures with the adoption of an innovation as the rationale for the policies and procedures’⁽³⁶⁾; and compliance/adherence referred to compliance of newly implemented policy requirements. Studies that explored enablers and barriers to implementation and/or adherence to healthy food and/or beverage policy relating to nutrition guidelines, regulations and/or restrictions on food and beverages availability, advertisement, placement or price were included. Studies that investigated views about potential implementation of healthy food and beverage policies were excluded. There were no restrictions on study design or study approach (e.g. qualitative or quantitative), year of publication or language.

Data extraction

A data extraction worksheet was developed based on the American Dietetic Association guidelines⁽³⁷⁾ for a comparison of included studies. A pilot extraction of two eligible studies was conducted by two reviewers independently. After comparing the results, minor modifications were made to the data extraction worksheet to improve clarity and ensure consistency among reviewers. Then, the reviewers extracted data from the remaining articles. Key information extracted from articles included title, type of policy, year of publication, author(s), study design and

methods, aims of the study, population characteristics, food and beverage policy, results (demographic characteristics and all results relating to barriers and enablers of policy implementation), and potential studies from the reference list. This information is summarised in Table 3.

The quality of individual studies was assessed by two researchers independently using the Appraising the Evidence: Reviewing Disparate Data Systematically checklist⁽³⁸⁾. This tool was developed to assess the quality of a diverse group of empirical studies, taking into account not just traditional measures of quantitative rigour but also the quality criteria of qualitative studies. This tool includes nine criteria that assess the practical applicability and scientific validity of each study. The quality attributes of each study were classified as ‘good’, ‘fair’, ‘poor’ and ‘very poor’. In-depth description of each rating criterion can be found in the online supplementary material of the original publication⁽³⁸⁾. The overall quality score was calculated for each individual study (0 very poor; 27 good). Then, the overall quality was classified as high ($\geq 70\%$ of total score), medium (60–69%) or low ($<60\%$). The outcomes of quality assessment are provided in Table 2.

Data analysis and synthesis

Findings from quantitative studies that reported on enablers and barriers to implementation and/or compliance of school-based healthy food and beverage policies were summarised. The Theoretical Domains Framework (TDF) guided the quantitative synthesis⁽³⁹⁾. TDF provides a method for theoretically assessing implementation-related barriers and enablers and is commonly used in clinical and community settings⁽⁴⁰⁾. The framework includes fourteen



Table 2 Quality assessment attributes for each study assessed using the Appraising the Evidence: Reviewing Disparate Data Systematically checklist

Study	Abstract/title	Introduction/aims	Method/data	Sampling	Data analysis	Ethics/bias	Findings/ results	Transferability/ generalisability	Implications/ usefulness	Overall quality
Abery & Drummond ⁽⁶²⁾	G	F	F	F	F	F	G	F	G	H
Agron <i>et al.</i> ⁽⁴⁴⁾	G	G	F	F	VP	F	F	G	G	H
Ardziejewska <i>et al.</i> ⁽⁶³⁾	G	G	F	F	P	P	G	F	P	M
Barratt <i>et al.</i> ⁽⁴⁵⁾	G	G	F	VP	G	VP	F	F	G	M
Chan <i>et al.</i> ⁽⁶⁹⁾	G	G	G	G	G	G	G	G	G	H
Cornish <i>et al.</i> ⁽⁴⁶⁾	G	G	F	G	F	F	G	G	G	H
Downs <i>et al.</i> ⁽⁶⁰⁾	F	F	G	P	F	G	F	P	F	M
Fernandes <i>et al.</i> ⁽⁵⁴⁾	G	G	G	G	G	G	G	G	G	H
Fournier <i>et al.</i> ⁽⁶¹⁾	G	G	G	G	G	G	G	G	G	H
Holthe <i>et al.</i> ⁽⁶⁷⁾	G	G	G	G	F	G	G	G	F	H
Longley & Sneed ⁽⁴⁷⁾	G	G	F	F	F	F	F	F	G	H
MacLellan <i>et al.</i> ⁽⁵⁹⁾	G	P	F	G	G	G	G	G	G	H
Masse <i>et al.</i> ⁽⁷⁰⁾	G	G	G	G	G	G	G	G	G	H
Brown <i>et al.</i> ⁽⁴⁹⁾	P	G	F	G	F	F	F	G	G	H
McCormack Brown <i>et al.</i> ⁽⁴⁸⁾	VP	P	F	P	P	G	P	P	P	L
McKenna ⁽⁵⁸⁾	G	G	P	VP	P	G	G	P	G	M
Moore <i>et al.</i> ⁽³²⁾	G	G	G	G	P	G	G	F	G	H
Patel <i>et al.</i> ⁽⁵⁰⁾	G	G	G	G	G	G	G	G	G	H
Pettigrew <i>et al.</i> ⁽⁶⁴⁾	G	F	P	G	F	G	P	F	F	H
Pettigrew <i>et al.</i> ⁽⁶⁵⁾	G	F	F	G	F	G	F	G	F	H
Quintanilha <i>et al.</i> ⁽⁵⁷⁾	G	G	G	G	G	G	G	G	G	H
Rana & Alvaro ⁽⁶⁶⁾	G	G	F	P	P	VP	F	F	F	L
Reeve <i>et al.</i> ⁽⁶⁸⁾	G	G	G	G	G	G	G	G	G	H
Roberts <i>et al.</i> ⁽⁵¹⁾	G	G	G	G	F	G	G	G	G	H
Sánchez <i>et al.</i> ⁽⁵²⁾	G	G	F	P	F	G	G	F	G	H
Stang <i>et al.</i> ⁽⁵³⁾	G	G	F	P	F	F	G	P	G	H
Taylor <i>et al.</i> ⁽⁵⁶⁾	G	F	G	G	F	G	G	G	G	H
Vine & Elliott ⁽⁵⁵⁾	G	G	G	P	F	G	G	F	G	H

G, 'good – 3 points'; F, 'fair – 2 points'; P, 'poor – 1 point'; VP, 'very poor – 0 point'; L, low quality; M, medium quality; H, high quality.

theoretical constructs: knowledge; skills; professional role and identity; beliefs about capabilities; optimism; beliefs about consequences; reinforcement; intentions; goals; memory, attention and decision; environmental context and resources; social influences; emotion; and behavioural regulation. A meta-synthesis approach was used to synthesise findings from qualitative studies. This approach systematically integrates qualitative evidence emerging from multiple studies to enhance the generalisability of each individual qualitative study^(41,42). Thematic analysis was used in this meta-synthesis following the steps described by Thomas and Harden⁽⁴³⁾. The initial analyses of quantitative and qualitative studies were conducted by the lead reviewer. First, the reviewer summarised the findings by coding barriers and enablers identified from the quantitative data to the relevant TDF constructs. Then, the reviewer coded the qualitative data extracted from the 'results' or 'findings' section of each study to develop descriptive themes and subthemes. The coded data were categorised either as 'enabler' or 'barrier' for each identified subtheme. In order to ensure the trustworthiness of data extraction, two among the rest of authors read drafts of the initial themes and descriptions. Then, the reviewers generated analytical themes based on descriptive themes, and a final version was agreed upon by all the reviewers.

Results

Search results and characteristics of included studies

The search yielded 6911 non-duplicate records. After screening the title and abstract, seventy-two full-text articles were assessed for eligibility, of which twenty-eight met the inclusion criteria. A description of included studies is shown in Table 3. Nearly half of the studies ($n = 11$) were conducted in the United States^(44–54), eight in Canada^(24,55–61), five in Australia^(62–66) and one each in the United Kingdom⁽³³⁾, Norway⁽⁶⁷⁾, Philippines⁽⁶⁸⁾ and Malaysia⁽⁶⁹⁾. Most studies ($n = 21$) focused on both primary and secondary schools^(24,44–47,50–54,57–61,63–68), four on primary schools exclusively^(33,56,62,69) and three on secondary schools only^(48,49,55). Nearly all policies ($n = 23$) were developed at governmental/federal levels. Most studies were conducted with school principals ($n = 19$) and/or food providers ($n = 13$), and some studies included teachers ($n = 8$), school board members ($n = 5$), parents and/or students ($n = 3$). Studies were published between 1997 and 2019, with most ($n = 21$) being conducted after 2010, and no studies published in other than the English language were considered.

Of the twenty-eight included studies, thirteen were qualitative investigations^(24,33,51,52,54,55,57–59,61,62,67,68), five were quantitative^(45,49,50,53,69) and ten used mixed-methods approaches^(44,46–48,56,60,63–66). However, out of the ten mixed-methods studies, nine used qualitative

approaches^(44,46,48,56,60,63–66) and one⁽⁴⁷⁾ used a quantitative approach to explore enablers and barriers. Therefore, twenty-two studies were included in the meta-synthesis and six in quantitative analysis. All the quantitative studies collected data through surveys^(45,47,49,50,53,69). Only four studies provided psychometric properties of their measurements, of which three studies^(49,50,69) used content validity and two^(45,69) used face validity to review their surveys. Semi-structured/in-depth interviews and/or focus groups were the most common data collection methods used by the qualitative studies ($n = 21$)^(24,33,44,46,48,51,52,54–59,61–68). One study used a survey with open-ended questions to collect qualitative data⁽⁶⁰⁾.

Study quality

Overall, the quality of studies was generally classified as good, with 79% achieving high overall quality rating and only 8% being rated at low quality (Table 2). However, many studies lacked detailed information regarding methodology (e.g. sampling and data analysis) and transferability criteria. Most importantly, a majority of the studies ($n = 22$) used a qualitative approach, so the transferability/generalisability criterion may not apply. Most studies received a 'good' or 'fair' rating for the abstract, introduction, results/findings, ethics/bias and implications/usefulness of study criteria. Only five studies received a 'good' rating for data analysis.

Quantitative findings

Enablers

Only three studies reported enablers for a healthy food and beverage policy implementation^(47,49,69), which fit within the TDF constructs of 'social influences', 'knowledge', 'professional role and identify' and 'environmental context and resources'. These studies reported that support from school staff members and concerns for children's health contribute to a successful implementation of a healthy food and beverage policy. Most school staff (52% of respondents) supported practices encouraging health-promoting food choices, such as banning soft drink advertisements and fast-food sales in primary schools⁽⁴⁹⁾. One-third of school district directors (36% of respondents) stated that staff's concerns for children's health support the development and implementation of policy⁽⁴⁷⁾. School administrators from Malaysia stated that school-based food policy is seen as a school's responsibility (71%) and a priority (83%), which enabled better policy implementation.

Barriers

Several barriers that undermined implementation and compliance with healthy food and beverage policies were identified. Five studies reported barriers relating to the TDF construct 'social influences'^(45,47,49,53,69). These studies reported a lack of policy implementation support and training for school staff, poor acceptance of healthy foods by the

Table 3 Characteristics of included studies (*n* 24) that explored enablers and barriers to implementation and compliance of school-based healthy food and beverage policies

Author(s) (year), country	Policy (type, year)	Aim(s)	Setting	Design and methods	Participants
Abery & Drummond (2014), Australia	Right Bite Healthy Food and Drinks Strategy for South Australian Schools and Preschools (governmental (state) level, 2008)	To elicit the perspectives of the broad range of stakeholders likely to be impacted	Primary schools	Qualitative (semi-structured interviews, focus groups, observation)	Interviews: school principals (<i>n</i> 2), canteen managers (<i>n</i> 2), parents (<i>n</i> 12); focus groups: students (<i>n</i> 36)
Agron <i>et al.</i> (2010), USA	Wellness Policy (federal, district level, 2006–7)	To understand the wellness environment in school districts across the country and to identify challenges districts face and needs they have in order to effectively implement, monitor and evaluate school wellness policies	All schools participating in federal nutrition programmes	Mixed methods* (survey, focus groups, key informant interviews)	Survey: school board members (<i>n</i> 2350), Action for Healthy Kids team members (<i>n</i> 527), members of the Association of State and Territorial Public Health Nutrition Directors (<i>n</i> 24); focus groups: school board members (<i>n</i> 37), policy/government directors (<i>n</i> 10), conference attendees (<i>n</i> 50); key informant interviews: stakeholders from school districts
Ardziejewska, Tadros & Baxter (2012), Australia	Fresh Taste @ School: NSW Healthy School Canteen Strategy (governmental (state) level, 2006)	To investigate the barriers and facilitators to, and the extent of the implementation of, the NSW 'Healthy School Canteen Strategy'	Government primary and secondary schools	Mixed methods* (audit, semi-structured interviews)	Audit: primary (<i>n</i> 2) and secondary (<i>n</i> 2) schools; interviews: school principals (<i>n</i> 4), canteen managers (<i>n</i> 3)
Barratt <i>et al.</i> (2004), USA	CDC's Guidelines for School Health Programs to Promote Lifelong Healthy Eating (local level, 1996)	To determine the extent to which North Carolina school districts had coordinated nutrition policies consistent with the CDC's Guidelines for School Health Programs; to discover ways in which existing nutrition policies could be improved; to explore barriers to designing and implementing policies	Public school districts	Quantitative (survey)	Food service directors (<i>n</i> 106)
Chan <i>et al.</i> (2018), Malaysia	School-based obesity prevention policies (governmental level)	To assess the awareness, facilitators and barriers to policy implementation related to obesity prevention for primary school children	Primary schools	Quantitative (online survey)	School administrators (<i>n</i> 447): assistant headmasters (56.6%), headmasters (36.9%), PE teachers (6.5%)
Cornish, Askelson & Golembiewski (2016), USA	Healthy, Hunger-Free Kids Act (governmental, national level, 2010)	To understand how rural food service directors perceive the new federal lunch requirements, the barriers they experience to implementing the requirements, and the support they use to implement the requirements	Rural school districts participating in National School Lunch Program	Mixed methods* (interviews, online and telephone survey)	Interviews: food service directors (<i>n</i> 67); online and telephone survey: food service directors (<i>n</i> 57)

Table 3 Continued

Author(s) (year), country	Policy (type, year)	Aim(s)	Setting	Design and methods	Participants
Downs <i>et al.</i> (2012), Canada	ANGCY (governmental level, 2008)	To explore the barriers associated with the adoption of ANGCY in schools according to characteristics of the innovation (guidelines) and the organisation (schools)	Schools	Mixed methods* (survey with open- and closed-ended questions)	Mainly school principals, teachers, office administrators, health promotion coordinators, food service providers, curriculum coordinators (<i>n</i> 357)
Fernandes <i>et al.</i> (2019), USA	Food as a Reward Policy and In-School Celebrations Policy (local, district level)	To assess how educators felt about implementing food as a reward and in-school celebrations policies	Public elementary and middle schools	Qualitative (semi-structured interviews)	Facilitators (<i>n</i> 14), administrators (<i>n</i> 12) and teachers (<i>n</i> 41)
Fournier <i>et al.</i> (2018), Arctic Canada	Junk Food Policy (local level, 2002)	To articulate the actions taken that facilitate the successful implementation and maintenance of the school food policy for policy learning	Public kindergarten to grade 12 schools	Qualitative (in-depth interviews)	School staff (<i>n</i> 14)
Holthe, Larsen & Samdal (2011), Norway	Norwegian National Guidelines for Healthy School Meals (governmental, national level)	To investigate the barriers to implementing the Norwegian national guidelines for healthy school meals as perceived by principals, project leaders, teachers and students	Primary and secondary schools	Qualitative (semi-structured interviews, focus groups)	Interviews: school principals (<i>n</i> 3), project leaders (<i>n</i> 3); focus groups: teachers (<i>n</i> 11), students (<i>n</i> 15)
Longley & Sneed (2009), USA	Wellness Policy (federal, district level, 2006–7)	To examine the process of wellness policy development in school districts in the United States following the 2004 mandate	Public school districts	Mixed methods* (telephone interviews, survey)	Telephone interviews: food service directors (<i>n</i> 21); survey: food service directors (<i>n</i> 363)
MacLellan <i>et al.</i> (2010), Canada	SNP (governmental, district level, 2006–7)	To explore parent and student perceptions of barriers and facilitating factors influencing the implementation of SNP	Elementary and consolidated schools	Qualitative (focus groups, interviews)	Focus groups: students (<i>n</i> 41); interviews: parents (<i>n</i> 12)
Masse, Naiman & Naylor (2013), Canada	Food and Beverage Sales in Schools Guidelines (adhere to 2007 Canada's Food Guide) (governmental, state level, 2007–8)	To explore the factors that impeded or facilitated the implementation of publicly mandated school-based PE and nutrition guidelines in the province of British Columbia	Elementary and high schools	Qualitative (semi-structured interviews)	School principals (<i>n</i> 17), teachers/school informants (e.g. cafeteria staff, home economics teachers) (<i>n</i> 33)
Brown <i>et al.</i> (2004), USA	School Nutrition Policy (not specified)	To determine: (a) California school board members' attitudes, perceptions and motivations related to enacting policies that support healthful eating in high schools; (b) mitigating barriers to adopting school policies that support healthful eating	High schools	Quantitative (survey)	School board members (<i>n</i> 174)


Table 3 *Continued*

Author(s) (year), country	Policy (type, year)	Aim(s)	Setting	Design and methods	Participants
McCormack Brown, Henry & Pitt (2001), USA	School Nutrition Policy (not specified)	To determine: (a) policymakers' attitudes, perceptions and motivations related to the enactment of policies that support healthy eating in high schools; (b) mitigating barriers to the adoption of school policies that support healthy eating	High schools	Mixed methods* (survey, key informant interviews)	Survey: school board members (<i>n</i> 38); key informant interviews: policymakers (<i>n</i> 57)
McKenna (2003), Canada	Food and Nutrition Policy for New Brunswick Schools (governmental level, 1990–1)	To examine the issues surrounding implementation, issues that may help explain why nutrition policies are not widespread in Canada	Schools	Qualitative (semi-structured interviews)	Participants involved in policy process (e.g. school principals, teachers, nutritionists, food service representatives, parents) (<i>n</i> 47)
Moore <i>et al.</i> (2010), UK	Appetite for Life (A4L) (governmental, national level, 2007–8)	(a) To explore the pragmatic influences on formal or informal LEA and primary school policies that affect the food available during school mealtimes; (b) to explore the professional practices of school catering staff that influence the food made available and served at lunch time	Primary schools	Qualitative (semi-structured interviews)	Headteachers (<i>n</i> 11), cooks-in-charge (<i>n</i> 10)
Patel <i>et al.</i> (2014), USA	Healthy, Hunger-Free Kids Act (governmental, national level, 2010) (Water in schools regulation)	To describe free drinking water access in schools by source and school location, as well as to examine school-level characteristics associated with schools that have excellent drinking water access; to explore barriers to improving water availability that would inform the recommendations for ways to increase drinking water access in school settings	Public schools	Quantitative (survey)	School principals, managers, food service directors (<i>n</i> 240)
Pettigrew <i>et al.</i> (2013), Australia	Healthy Food and Drink Policy (governmental, state level, 2007)	To identify school principals' perceptions of factors that influence schools' compliance with the new school nutrition policy and factors related to parents' beliefs about whether their children's diets are healthier as a result of the policy	Government primary and secondary schools	Mixed methods* (focus groups, interviews, survey)	Focus groups: parents (<i>n</i> 32); interviews: school stakeholders (principals, canteen managers, teachers) (<i>n</i> 48); survey: parents (<i>n</i> 1152), school principals (<i>n</i> 263)

Table 3 Continued

Author(s) (year), country	Policy (type, year)	Aim(s)	Setting	Design and methods	Participants
Pettigrew, Pescud & Donovan (2012), Australia	Healthy Food and Drink Policy (governmental, state level, 2007)	(a) To evaluate the policy to assess whether the concerns expressed in the immediate post-implementation period were well founded and to identify any implications for future policy development; (b) to investigate school principals' comparisons of canteen outcomes between 2006 and 2008	Government primary and secondary schools	Mixed methods* (interviews, survey)	Interviews: school principals (<i>n</i> 10); survey: school principals (<i>n</i> 310)
Quintanilha <i>et al.</i> (2013), Canada	ANGCY (governmental level, 2008)	To investigate how the motivation shown by school administration and stakeholders for ANGCY influenced the early adoption and implementation of the guidelines	Elementary and secondary schools	Qualitative (semi-structured interviews, direct observations)	Interviews: school principals, teachers, members of parent council, community worker, food service managers (<i>n</i> 18); direct observations: three schools
Rana & Alvaro (2010), Australia	Eat Well South Australia Schools and Preschools Healthy Eating Guidelines (governmental, state level, 2004)	To describe the implementation of the CREATE program in sixty-eight schools in South Australia	Government and non-government primary, secondary and combined schools	Mixed methods* (audit, interviews, focus groups)	Menu audits: schools (<i>n</i> 10); interviews: principals, canteen staff, teachers, nutritionists and others (<i>n</i> 254)
Reeve <i>et al.</i> (2018), Philippines	The Department of Education's Policy ('Orders') (governmental level)	To identify (a) barriers and enablers to effective school food policy development and implementation in the Philippines; (b) opportunities to develop more comprehensive policy frameworks in the area	Schools	Qualitative (semi-structured interviews)	National-level policymakers from health, education and agriculture (<i>n</i> 9), municipality-level health and education officers (<i>n</i> 3), school principals (<i>n</i> 4), food providers (<i>n</i> 3), a senior nutrition researcher and representative of the food regulatory authority
Roberts <i>et al.</i> (2009), USA	Texas Public School Nutrition Policy (governmental, state level, 2004)	To gain information about experiences with the Texas Public School Nutrition Policy from the perspective of principals and food service directors	Public schools	Qualitative (semi-structured interviews)	School principals (<i>n</i> 24), food service directors (<i>n</i> 10)
Sánchez <i>et al.</i> (2014), USA	Wellness Policy (federal, district level, 2004)	To examine school nutrition and physical activity policy implementation in two school districts in a northern New Mexico town	Public schools	Qualitative (interviews, focus groups)	Interviews: school-level administrators (<i>n</i> 9); focus groups: middle school students (<i>n</i> 16)


Table 3 *Continued*

Author(s) (year), country	Policy (type, year)	Aim(s)	Setting	Design and methods	Participants
Stang <i>et al.</i> (1997), USA	The US Dietary Guidelines (governmental, national level, 1996–7)	(a) To determine what changes food service personnel had already instituted in school menus to meet US Dietary Guidelines; (b) to identify self-perceived barriers that prevented food service staff from making changes to menus; (c) to identify self-perceived training needs of food service staff; (d) to determine the amount and type of nutrition education food service personnel provide in schools; (e) to identify self-perceived barriers that prevented food school service staff from providing nutrition education	All schools	Quantitative (survey)	Food service personnel (<i>n</i> 628)
Taylor <i>et al.</i> (2011), Canada	SNP (governmental level)	(a) To assess elementary school principals' perceptions of the extent to which their schools are implementing the key components of a school nutrition policy; (b) to assess how closely elementary schools are following policy regulations concerning the types and frequency of foods offered at school; (c) to explore the key enablers and barriers to policy implementation from the principals' perspective	Elementary schools	Mixed methods* (survey, in-depth interviews)	Survey: school principals (<i>n</i> 41); interviews: school principals (<i>n</i> 9)
Vine & Elliott (2013), Canada	School Food and Beverage Policy (PPM 150) (governmental level, 2011)	To explore how local-level factors shape policy implementation in Ontario, Canada	Secondary schools	Qualitative (in-depth, semi-structured interviews)	Key informant interviews (members of local public health units, school level participants) (<i>n</i> 22)

CDC, Centers for Disease Control and Prevention; PE, physical education; ANGKY, Alberta Nutrition Guidelines for Children and Youth; SNP, School Nutrition Policy.

*Qualitative data were extracted from mixed-methods studies that explored enablers and/or barriers to implementation and adherence to healthy food and beverage policies.



school community, and unhealthy fundraising practices such as 'bake sales' as barriers to implementation and compliance with healthy food and beverage policies. Five studies reported barriers relating to the TDF construct 'environmental context and resources'^(45,47,50,53,69). These studies identified the costs associated with policy implementation as a significant barrier. The costs associated with healthier foods such as fresh foods, lower-fat and lower-sodium foods^(45,47,53), equipment⁽⁶⁹⁾ or installation of facilities such as drinking water fountains⁽⁵⁰⁾ were identified as barriers by food service providers and school principals. Three studies identified barriers relating to the TDF construct 'goals'^(47,49,50), for example, food and nutrition policy not being a priority. In addition, one study reported barrier relating to the TDF construct 'reinforcement'⁽⁶⁹⁾, such as stating that there were no effect on non-compliance.

Qualitative findings

Five key themes emerged regarding the enablers and barriers to implementation of and compliance with school-based healthy food and beverage policies: (i) financial impact, (ii) physical food environments, (iii) characteristics of the policy, (iv) stakeholder engagement and (v) organisational priorities. The identified themes, subthemes and select quotes are presented in the online supplementary material.

Financial impact

This theme consisted of six subthemes: (i) policy-compliant food costs, (ii) changes in profit/revenue, (iii) human resources, (iv) funding, (v) fundraising and (vi) food wastage. Only four studies reported positive or no financial impact after the implementation of healthy food and beverage policy^(24,46,52,65). A majority of studies (n 14) reported that the implementation of healthy food and beverage policy had a negative financial impact, such as stating that policy-compliant foods costed more^(46,55,60,62,66) and reduced profits and revenue^(24,33,46,48,55,56,58,60,62,63,67,68).

Some school stakeholders reported a loss of catering/canteen staff due to a reduction of profits^(55,67), and some schools ran lunch programmes through volunteers who had minimal food preparation and policy compliance knowledge^(59,62). Students discarding healthy foods or food service staff preparing excessive quantities of perishable food was identified as a barrier to policy implementation^(33,46). In addition, some schools reported fundraising involving selling unhealthy foods such as 'candy', 'soft drinks', 'chips' and 'donuts'^(51,52). This was seen as a major barrier to compliance with healthy food and beverage policy by school principals, administrators and students.

Physical food environments

This theme consisted of four subthemes: (i) policy-compliant food availability, (ii) geographical proximity of unhealthy foods, (iii) nexus between home and school and

(iv) resources. None of the studies reported enablers associated with the physical environment impacting policy implementation. Policy-compliant food availability was reported as a barrier in four studies^(46,55,56,60). These studies indicated that it is challenging to find suppliers who can supply policy-compliant foods.

Geographical proximity of food outlets mainly selling discretionary foods was identified as a major barrier in seven studies^(24,52,55,56,60,63,67,68). These studies stated that food outlets around schools selling unhealthy foods to schoolchildren consequently affect policy implementation and the profits of food providers within schools. Interestingly, one study stated that the school authority worked with a neighbourhood store manager to reduce sale of unhealthy food during school hours, which positively impacted policy implementation⁽⁶¹⁾. The home environment, including unhealthy foods brought from home, lack of parents' support to policies and low levels of food literacy, was seen as barriers for policy implementation and compliance in five studies^(33,52,57,60,63). In addition, some schools were unable to fully implement healthy food and nutrition policy due to a lack of facilities, including reduced operating hours of the canteen^(56,60,67).

Characteristics of the policy

This theme consisted of four subthemes: (i) knowledge and understanding of the policy, (ii) policy communication and clarity, (iii) management of the policy and (iv) accountability. Studies reported that school-based policies were often unclear and 'open to interpretation', and some stakeholders were treating school policy as not mandatory or lacking policy application knowledge^(24,46,48,58,60,62,63).

A lack of dialogue with targeted people during policy drafting stage, a lack of clarity and the use of a 'dictatorial voice' in policy statements were seen as barriers in healthy food policy implementation and compliance^(46,51,58,59,62). School stakeholders stated that they were not consulted during policy development as the policy was developed from a 'top-down' approach. Some stakeholders were overwhelmed with sudden changes required following the introduction of new policy and suggested that it needed to be a gradual process. Indeed, one study reported policy implementation by a 'harm reduction' approach where the policy on unhealthy foods was introduced gradually, which acted as an enabler⁽⁶¹⁾. Only three studies reported policy communication as an enabler, stating that school stakeholders were well informed about the policy and the reasons for change^(61,64,65).

Good policy introduction and implementation was seen as an enabler to implementation and compliance. Examples include a constant review of compliance with policy, a collaborative approach to decision-making, and collaboration between different state agencies such as education, agriculture and health^(44,55,57,58,61,63,64). One study reported poor management practices as a barrier



to policy implementation as it was left up to each individual school to implement, without providing a broader implementation framework or assistance⁽⁵²⁾. Lack of accountability was also seen as a barrier to compliance with the healthy food and beverage policy⁽⁵²⁾.

Stakeholder engagement

This theme consisted of four subthemes: (i) attitudes of school staff, (ii) students' preferences and attitudes, (iii) attitudes of parents and (iv) big food (industrial, convenience food producers and manufacturers) influence. Nine studies reported negative attitudes of school staff^(46,51,55,56,58–60,62,67) towards healthy food and beverage policies, and only four studies reported positive attitudes^(46,57,58,61). Such attitudes reportedly impacted policy implementation and compliance. The main basis of negative attitudes included: teachers should not be responsible for students' dietary choices; food choices should not be limited; and disagreements regarding the provision of food rewards for students and limiting fundraising opportunities involving unhealthy foods, such as confectionary. One study reported a lack of motivation in implementing policies, for example, school principals being overwhelmed with what they need to deliver⁽⁶⁸⁾.

Students' preferences and demands for unhealthy foods reportedly impacted healthy food and beverage policy implementation and compliance in eight studies^(32,52,56,59–61,63,67). Some studies stated that demands for unhealthy foods and loss of canteen sales led to deliberate compliance breaches. However, some respondents reported receiving no complaints from students regarding policy-compliant foods and described the policy implementation process as 'smooth'^(46,56,59,65). The respondents also observed positive dietary behaviours such as increased consumption of fruit and vegetables and acceptance of other healthy foods.

Some studies reported parents as a barrier to healthy food and beverage policy implementation^(57,60,62). Specifically, parents viewed that policy implementation eliminated students' freedom to choose what to eat or buy⁽⁵⁷⁾. Other respondents indicated that some parents are very proactive and support the healthy food and beverage policy^(57,59,65). In addition, two study reported that Big Food companies (e.g. Pepsi, Coca-Cola, McCain Foods, etc.) had a negative influence on policy implementation. For example, some argued that schools are denying students' choices⁽⁵⁸⁾, and in Philippines, Big Food was often involved in advertising unhealthy foods and providing sponsorship⁽⁶⁸⁾.

Organisational priorities

This theme consisted of two subthemes: (i) academic performance and (ii) other competing priorities. Some respondents, mainly teachers and school principals, argued that academic performance is a school's top priority^(44,46,48,55,62,70), and schools are under pressure to

improve academic performance of their students. Therefore, food and nutrition policy is not a priority. Some respondents indicated that the policy implementation would lead to students going hungry due to policy-compliant foods being unpopular among students, and this might lead to low participation in class and consequently poor learning and academic performance. In addition, one study reported teachers as having stated that healthy food policy is insensitive to students' needs as children in disadvantaged communities often come hungry; therefore, teachers lacked motivation in implementing such policies⁽⁵⁴⁾.

Discussion

The aim of this systematic literature review and meta-synthesis was to explore enablers and barriers to effective implementation and compliance with school-based food and beverage policies. Five themes were identified through a meta-synthesis as enablers and barriers to the implementation and compliance with healthy food and beverage policies, and there was an alignment between the findings of studies using quantitative and qualitative methods. The most commonly reported barriers included costs and availability associated with policy-compliant foods, decrease in profit and revenue, close proximity of outlets selling unhealthy food, lack of human and material resources for implementation, poor knowledge and understanding of the policy, and negative attitudes of stakeholders towards the policy. Only a few policy implementation enablers were identified, including sufficient funding, effective policy communication and clarity, good policy implementation process, and positive attitudes of stakeholders towards policies. Similar findings have been observed in a systematic literature review on the barriers and facilitators to the implementation of physical activity policies in a school setting⁽⁷¹⁾, showing that broader recommendations could be drawn for organisations working on any school-based policy implementation.

A particularly strong theme was financial barriers. Several studies stated that healthy foods cost more, and school canteen's profits and revenue decreased post-implementation. This reportedly forced some schools to seek fundraising opportunities, which involved unhealthy foods to recover lost profits. However, one study suggested that most schools did not experience any overall losses in revenue associated with the implementation of school-based healthy food and beverage policies⁽⁷²⁾. Moreover, in a randomised controlled trial of the implementation of a healthy canteen policy in Australia, there were no adverse financial effects of policy implementation on canteen revenue⁽⁷³⁾. Communicating such evidence prior to policy implementation may help allay school staff's concerns and reduce the salience of this barrier. However, the costs associated with healthy foods was found to be a key driver in



consumer choice⁽⁷⁴⁾. One strategy to reduce the costs of healthy foods includes the introduction of cross-subsidy pricing strategies, where revenues generated via increases in the price of less-healthy foods may be used to reduce the prices of more-healthy options⁽⁷⁵⁾. The engagement of schools in a food cooperative or purchasing healthy foods at lower prices through shared purchasing of foods may represent another potential strategy to address this barrier^(19,76).

A number of studies reported difficulty in sourcing policy-compliant foods and beverages, consistent with research in a health service setting⁽⁷⁷⁾. It might be that food catering managers and staff need more support from nutritional experts (e.g. dietitians and nutritionists) to enable the identification of compliant foods. In addition, canteen managers could advocate food companies to reformulate their products to meet healthier standards, thereby increasing the breadth of healthier options for canteen managers to choose from⁽⁷⁸⁾. For example, in the United Kingdom, the Responsibility Deal's Food Network was established in 2011 to engage the food industry in reformulating foods by reducing salt content, trans fatty acids and energy content⁽⁷⁸⁾.

Lack of knowledge and understanding of the healthy food and beverage policy was another commonly cited barrier for policy implementation and compliance. Failing to understand the policy's purpose might also create negative stakeholder attitudes. Positive attitudes towards policy were identified as an enabler for the implementation of policies, but most studies reported negative attitudes from teaching staff, parents and students. The main argument regarding negative attitudes was that healthy food and beverage policy restricted students' choices and the lack of consultation with stakeholder during policy development. While some stakeholders were concerned that policies restricted students' choices, a recent Australian study showed that students are in favour of eliminating unhealthy foods and increasing access to nutritious foods in school canteens⁽⁷⁹⁾. To address the negative attitudes, stakeholder engagement should be included during policy development. Stakeholder involvement and engagement could help identify any potential barriers early in the process⁽⁸⁰⁾. Indeed, a study reported that staff, parent and student involvement in healthy food and beverage policy implementation showed better outcomes such as reduced availability of nutrient-poor foods⁽⁸⁰⁾. While stakeholder engagement may improve attitudes, monitoring of healthy food and beverage policies might be the best option for effective adherence, as some studies stated that a lack of monitoring services is the reason for non-compliance. For example, Swinburn *et al.*⁽⁸¹⁾ stated that there is a need to move from responsibility to accountability for a successful implementation of healthy food policy. Accountability may enhance adherence to healthy food policy. Therefore, there is a need to establish governmental agencies and develop monitoring initiatives to ensure that

schools are made accountable for breach of compliance with healthy food and beverage policies⁽⁸¹⁻⁸³⁾.

Limitations of the study

Our review provides a comprehensive literature analysis of enablers and barriers relating to healthy school-based food and beverage policy implementation and compliance using both quantitative and qualitative methods. However, limitations should be acknowledged. Although we used a systematic search protocol, it might be that some relevant publications were missing, such as governmental evaluation reports. The low-to-moderate quality relating to transferability/generalisability and data analysis of qualitative studies suggests the need to conduct additional research in different countries and more thorough reporting of analytical methods in the future studies. Qualitative researches need to provide more detailed information on methods used in data analysis. In terms of transferability, we tried to address this limitation through meta-synthesis, which enhanced the transferability of each individual qualitative study^(41,42).

Conclusion and recommendations for future research and practice

When implemented successfully, school food policies have been consistently found to be of benefit to students' dietary outcomes⁽¹⁵⁾. Despite this, the implementation of such policies in many international jurisdictions remains limited⁽⁸⁴⁾. This review provides a comprehensive synthesis of research evidence regarding the enablers and impediments to food policy implementation, with a view to inform strategy development in support of public health policy implementation⁽⁸⁵⁾. The findings of this review, therefore, inform school-based nutrition policymakers about a variety of factors that need to be considered during the development and implementation of such policies. Given the nascent state of implementation research in the field of school-based nutrition⁽⁸⁶⁾, our review also provides good grounding for the testing of strategies to improve the implementation of nutrition policies. To date, only few randomised controlled trials have aimed to improve the implementation of school-based healthy eating policies or practices by reducing the barriers identified in the literature^(73,87).

The findings of our systematic review suggest several important directions for future research. First, the low-to-moderate quality of evidence suggests that higher-quality evidence with a specific focus on improving the data analysis of qualitative studies is required. Most of the included studies were conducted in English-speaking countries, and all were conducted in established western economies. Since the health effects of poor food and beverage intake is a global problem, more research is needed to evaluate policies being implemented in emerging economies. Also, future research should investigate the differences in policy



implementation between different types of schools, as most studies included in this review focused on only primary and secondary schools. Some evidence suggests that food environments, including policies and regulations, tend to be overlooked in secondary schools⁽⁸⁸⁾. Finally, the limited amount of research in this area suggests that many school-based policies have been scarcely evaluated in terms of barriers and enablers, or that these evaluations remain to be disseminated. We would urge researchers to engage with stakeholders to ensure that new and existing school-based policies are thoroughly evaluated.

The findings of this systematic review provide policy-makers with strategies to improve the implementation and compliance of new policies. These strategies include ensuring a reporting or monitoring component to improve compliance and address school's concerns prior to policy implementation. Policymakers may also need to ensure that schools are provided with sufficient resources and support to implement the policy and all stakeholders are involved during policy development and implementation stages.

Acknowledgements

Acknowledgements: The authors would like to thank Associate Professor Jason Wu for insightful and helpful feedback on this manuscript. **Financial support:** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The study also did not receive any specific non-financial support. **Conflict of interest:** No conflict of interest was declared. **Authorship:** R.R. developed the research question and drafted a protocol. All authors reviewed and accepted the protocol. R.R. and N.R. conducted the searches, screening, data extraction and quality assessment. A.W. acted as a third reviewer in this process. R.R. coded and analysed quantitative and qualitative data under the supervision of A.W., T.S. and C.L. L.W. R.R. and N.R. drafted the manuscript. All authors approved the final manuscript and declare this content has not been published elsewhere. **Ethics of human subject participation:** Ethical approval was not required because the submitted article is a systematic review, and the findings of existing studies are available in the public domain. The protocol for this review prospectively was registered with PROSPERO (registration number CRD42017078940) and can be accessed at <http://www.crd.york.ac.uk/PROSPERO/>.

Supplementary material

For supplementary material accompanying this article visit <https://doi.org/10.1017/S1368980019004865>

References

1. Lobstein T, Jackson-Leach R, Moodie ML *et al.* (2015) Child and adolescent obesity: part of a bigger picture. *Lancet* **385**, 2510–2520.
2. Pulgarón ER (2013) Childhood obesity: a review of increased risk for physical and psychological comorbidities. *Clin Ther* **35**, A18–A32.
3. Ogden CL, Carroll MD, Kit BK *et al.* (2014) Prevalence of childhood and adult obesity in the United States, 2011–2012. *JAMA* **311**, 806–814.
4. Alleyne G, Binagwaho A, Haines A *et al.* (2013) Embedding non-communicable diseases in the post-2015 development agenda. *Lancet* **381**, 566–574.
5. Shetty P (2013) Nutrition transition and its health outcomes. *Indian J Pediatr* **80**, 21–27.
6. Forouzanfar MH, Alexander L, Anderson HR *et al.* (2015) Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* **386**, 2287–2323.
7. Al Ani M, Al Subhi LK & Bose S (2016) Consumption of fruits and vegetables among adolescents: a multi-national comparison of eleven countries in the Eastern Mediterranean Region. *Br J Nutr* **116**, 1799–1806.
8. Boylan S, Hardy L, Drayton B *et al.* (2017) Assessing junk food consumption among Australian children: trends and associated characteristics from a cross-sectional study. *BMC Public Health* **17**, 299.
9. Zahra J, Ford T & Jodrell D (2014) Cross-sectional survey of daily junk food consumption, irregular eating, mental and physical health and parenting style of British secondary school children. *Child Care Health Dev* **40**, 481–491.
10. World Health Organization (WHO) (2014) Global Status on Non-Communicable Diseases. Geneva: World Health Organization; available at http://apps.who.int/iris/bitstream/handle/10665/148114/9789241564854_eng.pdf;jsessionid=AB774B01547F67CFF7117F5805164D0A?sequence=1.
11. Sawyer SM, Afifi RA, Bearinger LH *et al.* (2012) Adolescence: a foundation for future health. *Lancet* **379**, 1630–1640.
12. Vandevijvere S & Tseng M (2013) Towards comprehensive global monitoring of food environments and policies to reduce diet-related non-communicable diseases. *Public Health Nutr* **16**, 2101–2104.
13. Swinburn B, Egger G & Raza F (1999) Dissecting obesogenic environments: the development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Prev Med* **29**, 563–570.
14. Hawkes C, Smith TG, Jewell J *et al.* (2015) Smart food policies for obesity prevention. *Lancet* **385**, 2410–2421.
15. Jaime PC & Lock K (2009) Do school based food and nutrition policies improve diet and reduce obesity? *Prev Med* **48**, 45–53.
16. Bell A & Swinburn B (2004) What are the key food groups to target for preventing obesity and improving nutrition in schools? *Eur J Clin Nutr* **58**, 258–263.
17. Briefel RR, Wilson A & Gleason PM (2009) Consumption of low-nutrient, energy-dense foods and beverages at school, home, and other locations among school lunch participants and nonparticipants. *J Am Diet Assoc* **109**, S79–S90.
18. Perez-Rodrigo C & Aranceta J (2003) Nutrition education in schools: experiences and challenges. *Eur J Clin Nutr* **57**, S82–S85.
19. Story M, Kaphingst KM, Robinson-O'Brien R *et al.* (2008) Creating healthy food and eating environments: policy and environmental approaches. *Annu Rev Public Health* **29**, 253–272.
20. Rathi N, Riddell I & Worsley A (2016) Food environment and policies in private schools in Kolkata, India. *Health Promot Int* **32**, 340–350.



21. Ronto R, Ball L, Pendergast D *et al.* (2017) What is the status of food literacy in Australian high schools? Perceptions of home economics teachers. *Appetite* **108**, 326–334.
22. Ronto R, Ball L, Pendergast D *et al.* (2016) Food literacy at secondary schools in Australia. *J Sch Health* **86**, 823–831.
23. Lawlis T, Knox M & Jamieson M (2016) School canteens: a systematic review of the policy, perceptions and use from an Australian perspective. *Nutr Diet* **73**, 389–398.
24. Måsse LC, Naiman D & Naylor P-J (2013) From policy to practice: implementation of physical activity and food policies in schools. *Int J Behav Nutr Phys Act* **10**, 71.
25. Vepsäläinen H, Mikkilä V, Erkkola M *et al.* (2015) Association between home and school food environments and dietary patterns among 9–11-year-old children in 12 countries. *Int J Obes Suppl* **5**, S66–S673.
26. Swinburn BA, Sacks G, Hall KD *et al.* (2011) The global obesity pandemic: shaped by global drivers and local environments. *Lancet* **378**, 804–814.
27. Swinburn BA (2008) Obesity prevention: the role of policies, laws and regulations. *Aust New Zealand Health Policy* **5**, 12.
28. Finkelstein DM, Hill EL & Whitaker RC (2008) School food environments and policies in US public schools. *Pediatrics* **122**, e251–e259.
29. Adamson A, Spence S, Reed L *et al.* (2013) School food standards in the UK: implementation and evaluation. *Public Health Nutr* **16**, 968–981.
30. Fletcher A, Jamal F, Fitzgerald-Yau N *et al.* (2014) ‘We’ve got some underground business selling junk food’: qualitative evidence of the unintended effects of English school food policies. *Sociology* **48**, 500–517.
31. Kim J (2012) Are physical education-related state policies and schools’ physical education requirement related to children’s physical activity and obesity? *J Sch Health* **82**, 268–276.
32. Moore S, Murphy S, Tapper K *et al.* (2010) From policy to plate: barriers to implementing healthy eating policies in primary schools in Wales. *Health Policy* **94**, 239–245.
33. Moher D, Liberati A, Tetzlaff J *et al.* (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* **6**, e1000097.
34. Schardt C, Adams MB, Owens T *et al.* (2007) Utilization of the PICO framework to improve searching PubMed for clinical questions. *BMC Med Inform Decis Mak* **7**, 16–26.
35. University Oxford. Oxford Dictionaries; available at <https://en.oxforddictionaries.com/>.
36. Fixsen D, Naoom S, Blase K, *et al.* (2005) *A Review and Synthesis of the Literature Related to Implementation of Programs and Practices*. Tampa, FL: Florida Mental Health Institute, National Implementation Research Network.
37. American Dietetic Association (2005) *ADA Evidence Analysis Manual*. Chicago, IL: American Dietetic Association.
38. Hawker S, Payne S, Kerr C *et al.* (2002) Appraising the evidence: reviewing disparate data systematically. *Qual Health Res* **12**, 1284–1299.
39. Cane J, O’Connor D & Michie S (2012) Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implement Sci* **7**, 37.
40. Atkins L, Francis J, Islam R *et al.* (2017) A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implement Sci* **12**, 77.
41. Sandelowski M, Docherty S & Emden C (1997) Focus on qualitative methods qualitative metasynthesis: issues and techniques. *Res Nurs Health* **20**, 365–372.
42. Jensen LA & Allen MN (1996) Meta-synthesis of qualitative findings. *Qual Health Res* **6**, 553–560.
43. Thomas J & Harden A (2008) Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Med Res Methodol* **8**, 45.
44. Agron P, Berends V, Ellis K *et al.* (2010) School wellness policies: perceptions, barriers, and needs among school leaders and wellness advocates. *J Sch Health* **80**, 527–535.
45. Barratt RD, Cross NA, Mattfeldt-Beman MK, *et al.* (2004) School policies that promote healthy eating: a survey of food-service directors in North Carolina public schools. *J Child Nutr Manage* **1**, 1–14.
46. Cornish D, Askelson N & Golembiewski E (2016) “Reforms looked really good on paper”: rural food service responses to the Healthy, Hunger-Free Kids Act of 2010. *J Sch Health* **86**, 113–120.
47. Longley CH & Sneed J (2009) Effects of federal legislation on wellness policy formation in school districts in the United States. *J Am Diet Assoc* **109**, 95–101.
48. McCormack Brown K, Henry T & Pitt S (2001) Formative Research: Key Informant Interviews for the Examination of Communication Factors Affecting Policymakers. California Project LEAN of the California Department of Health Services and the Public Health Institute 916, 445–3500.
49. Brown KM, Akintobi TH, Pitt S *et al.* (2004) California school board members’ perceptions of factors influencing school nutrition policy. *J Sch Health* **74**, 52–58.
50. Patel AI, Hecht K, Hampton KE *et al.* (2014) Tapping into water: key considerations for achieving excellence in school drinking water access. *Am J Public Health* **104**, 1314–1319.
51. Roberts SM, Pobocik RS, Deek R *et al.* (2009) A qualitative study of junior high school principals’ and school food service directors’ experiences with the Texas school nutrition policy. *J Nutr Educ Behav* **41**, 293–299.
52. Sánchez V, Hale R, Andrews M *et al.* (2014) School wellness policy implementation: insights and recommendations from two rural school districts. *Health Promot Pract* **15**, 340–348.
53. Stang JS, Story M, Kalina B *et al.* (1997) Meeting the U.S. Dietary Guidelines in school meals: current practices, perceived barriers, and future training needs. *J Nutr Educ Behav* **29**, 152–158.
54. Fernandes CF, Schwartz MB, Ickovics JR *et al.* (2019) Educator perspectives: selected barriers to implementation of school-level nutrition policies. *J Nutr Educ Behav* **51**, 843–849.
55. Vine MM & Elliott SJ (2014) Examining local-level factors shaping school nutrition policy implementation in Ontario, Canada. *Public Health Nutr* **17**, 1290–1298.
56. Taylor JP, MacLellan D, Caiger JM *et al.* (2011) Implementing elementary school nutrition policy: principals’ perspectives. *Can J Diet Pract Res* **72**, e205–e211.
57. Quintanilha M, Downs S, Liefers J *et al.* (2013) Factors and barriers associated with early adoption of nutrition guidelines in Alberta, Canada. *J Nutr Educ Behav* **45**, 510–517.
58. McKenna ML (2003) Issues in implementing school nutrition policies. *Can J Diet Pract Res* **64**, 208–213.
59. MacLellan D, Holland A, Taylor J *et al.* (2010) Implementing school nutrition policy: student and parent perspectives. *Can J Diet Pract Res* **71**, 172–177.
60. Downs SM, Farmer A, Quintanilha M *et al.* (2012) From paper to practice: barriers to adopting nutrition guidelines in schools. *J Nutr Educ Behav* **44**, 114–122.
61. Fournier B, Illasiak V, Kushner KE *et al.* (2018) The adoption, implementation and maintenance of a school food policy in the Canadian Arctic: a retrospective case study. *Health Promot Int* **33**, 1–10.
62. Abery E & Drummond C (2012) Implementation of mandatory nutritional guidelines in South Australian primary school canteens: a qualitative study. *J Nutr Educ Behav* **44**, 114–122.
63. Ardzejewska K, Tadros R & Baxter D (2013) A descriptive study on the barriers and facilitators to implementation of the NSW (Australia) Healthy School Canteen Strategy. *Health Educ J* **72**, 136–145.
64. Pettigrew S, Donovan RJ, Jalleh G *et al.* (2013) Predictors of positive outcomes of a school food provision policy in Australia. *Health Promot Int* **29**, 317–327.



65. Pettigrew S, Pescud M & Donovan RJ (2012) Outcomes of the West Australian school healthy food and drink policy. *Nutr Diet* **69**, 20–25.
66. Rana L & Alvaro R (2010) Applying a Health Promoting Schools approach to nutrition interventions in schools: key factors for success. *Health Promot J Austr* **21**, 106–113.
67. Holthe A, Larsen T & Samdal O (2011) Understanding barriers to implementing the Norwegian national guidelines for healthy school meals: a case study involving three secondary schools. *Matern Child Nutr* **7**, 315–327.
68. Reeve E, Thow AM, Bell C *et al.* (2018) Implementation lessons for school food policies and marketing restrictions in the Philippines: a qualitative policy analysis. *Globalization and Health* **14**, 8.
69. Chan C, Moy FM, Lim JNW *et al.* (2018) Awareness, facilitators, and barriers to policy implementation related to obesity prevention for primary school children in Malaysia. *Am J Health Promot* **32**, 806–811.
70. Masse LC, Naiman D & Naylor PJ (2013) From policy to practice: implementation of physical activity and food policies in schools. *Int Behav Nutr Phys Act* **10**, 71.
71. Nathan N, Elton B, Babic M *et al.* (2018) Barriers and facilitators to the implementation of physical activity policies in schools: a systematic review. *Prev Med* **107**, 45–53.
72. Wharton CM, Long M & Schwartz MB (2008) Changing nutrition standards in schools: the emerging impact on school revenue. *J School Health* **78**, 245–251.
73. Wolfenden L, Nathan N, Janssen LM *et al.* (2017) Multi-strategic intervention to enhance implementation of healthy canteen policy: a randomised controlled trial. *Implement Sci* **12**, 6.
74. Faber M, Laurie S, Maduna M *et al.* (2014) Is the school food environment conducive to healthy eating in poorly resourced South African schools? *Public Health Nutr* **17**, 1214–1223.
75. Mozaffarian D, Angell SY, Lang T *et al.* (2018) Role of government policy in nutrition – barriers to and opportunities for healthier eating. *BMJ* **361**, k2426.
76. Grech A & Allman-Farinelli M (2015) A systematic literature review of nutrition interventions in vending machines that encourage consumers to make healthier choices. *Obes Rev* **16**, 1030–1041.
77. Boelsen-Robinson T, Backholer K, Corben K *et al.* (2017) The effect of a change to healthy vending in a major Australian health service on sales of healthy and unhealthy food and beverages. *Appetite* **114**, 73–81.
78. Buttriss JL (2013) Food reformulation: the challenges to the food industry. *Proc Nutr Soc* **72**, 61–69.
79. Stephens LD, McNaughton SA, Crawford D *et al.* (2015) Nutrition promotion approaches preferred by Australian adolescents attending schools in disadvantaged neighbourhoods: a qualitative study. *BMC Pediatr* **15**, 61.
80. Rathi N, Riddell L, Worsley A *et al.* (2018) Barriers to nutrition promotion in private secondary schools in Kolkata, India: perspectives of parents and teachers. *Int J Environ Res Public Health* **15**, 1–9.
81. Swinburn B, Kraak V, Rutter H *et al.* (2015) Strengthening of accountability systems to create healthy food environments and reduce global obesity. *Lancet* **385**, 2534–2545.
82. Woods J, Bressan A, Langelaan C *et al.* (2014) Australian school canteens: menu guideline adherence or avoidance? *Health Promot J Austr* **25**, 110–115.
83. Lucas PJ, Patterson E, Sacks G *et al.* (2017) Preschool and school meal policies: an overview of what we know about regulation, implementation, and impact on diet in the UK, Sweden, and Australia. *Nutrients* **9**, 736.
84. Hills A, Nathan N, Robinson K *et al.* (2015) Improvement in primary school adherence to the NSW Healthy School Canteen Strategy in 2007 and 2010. *Health Promot J Austr* **26**, 89–92.
85. Michie S, Van Stralen MM & West R (2011) The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* **6**, 42.
86. Wolfenden L, Nathan NK, Sutherland R, *et al.* (2017) Strategies for enhancing the implementation of school-based policies or practices targeting risk factors for chronic disease. *Cochrane Database Syst Rev* issue 11, CD01167.
87. Rabin BA, Glasgow RE, Kerner JF *et al.* (2010) Dissemination and implementation research on community-based cancer prevention: a systematic review. *Am J Prev Med* **38**, 443–456.
88. Ronto R, Ball L, Pendergast D *et al.* (2016) Adolescents' perspectives on food literacy and its impact on their dietary behaviours. *Appetite* **107**, 549–557.