STUDY PROTOCOL

Barriers and facilitators to the implementation of nutrition standards for school food: a mixed methods systematic review protocol [version 1; peer review: 1 approved with reservations]

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Abstract

Background: The importance of nutrition during childhood and the high prevalence of child and adolescence obesity has resulted in several countries implementing nutritional standards for school food as a way of providing healthy school food environments. Yet there has been less focus on the barriers and facilitators influencing the process of implementing school food standards. This mixed methods systematic review aims to address this evidence gap by synthesising the empirical evidence on the factors that may influence implementation of school food standards.

Methods: This mixed methods systematic review will use qualitative, quantitative and mixed methods evidence from peer reviewed publications retrieved from the following databases; PubMed, CINAHL, Scopus, EMBASE, PsycINFO and Web of Science. Grey literature will be accessed through Google Scholar, Open Access Theses and Dissertations, OpenGrey, RIAN, ETHOS, ProQuest, WorldCat, Networked Digital Library of Theses and Dissertations, and public health organisation websites will also be accessed. Screening reference lists and citation chaining of all included studies will also be undertaken. No restrictions on publication date or language will be applied, however, only primary research studies relevant to supply-side stakeholders will be eligible for inclusion. Study quality will be assessed using the Mixed Methods Appraisal Tool. Study titles and abstracts will be screened to decide whether the full text manuscript should be retrieved. For screening reliability, a second review author will assess a random sample of 20%. Kappa statistics will be used to assess inter-rater reliability, with values of 0.75 and higher representing high agreement. Two authors will independently extract data and factors reported to influence implementation. This will be synthesized using the Theoretical Domains Framework.

Discussion: A comprehensive understanding of these factors can provide guidance to relevant stakeholders to enhance the adaption, implementation and sustainability of nutrition standards for school meals.

Systematic review registration: PROSPERO CRD42019117904
**Keywords**
Mixed methods, Systematic review, Barriers, Facilitators, School meal standards, School food guidelines, Implementation, Schools

This article is included in the Maternal and Child Health collection.

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**Author roles:**
- **O'Mahony B**: Conceptualization, Funding Acquisition, Methodology, Writing – Original Draft Preparation, Writing – Review & Editing;
- **Kerins C**: Conceptualization, Methodology, Writing – Original Draft Preparation, Writing – Review & Editing;
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- **Kelly C**: Conceptualization, Funding Acquisition, Methodology, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing

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Difficulties associated with preparing and serving fresh food at schools include: programme coordinators and contracted catering suppliers. Some ice directors, catering managers and staff, school management, and organisational implications for principals; and the requirement of staff training around the food guidelines30,31. Positively, in contrast, caterers in the UK found the food standards relatively easy to achieve32. However, there has been little synthesis of this research, particularly from the perspective of supply-side stakeholders.

Background

Schools are a key setting for the promotion of health and well-being2,3. They are one of the most effective ways of reaching a large segment of the population4,5, with no other institution having as much continuous contact and influence during the first stages of their life6.

One of the many ways that schools can support health is by the food that they provide7. Good nutrition is associated with academic performance8, psychological well-being and school attendance9,10. Up to a third of a child’s daily micronutrient intake can come from a school lunch11,12. Additionally school meals can provide between 20 to 70% of a child’s energy requirements13, thus further strengthening the need for healthy school meals. Coupled with this, is a high prevalence of obesity among young people and the critical influence schools can play in supporting active living, healthy diets and body weight. This has resulted in many governmental school-based nutrition initiatives and policies, including nutrition standards for school meals being adopted14. However, the effectiveness of school based policies on childhood and adolescence nutrition and obesity depends on their implementation, which is often less than optimal, even when these policies are obligatory15.

To date, a number of countries and regions around the world have introduced nutrition standards for school food on a mandatory basis. These include Sweden in 199716, Finland in 194317, Norway in 200118, Slovenia in 2010, a reintroduction of compulsory guidelines after 21 years in England in 200119 and an updated National School Lunch Programme in America in 2012, which will be phased into all schools by 202320.

Differences exist in the provision of school food in Europe and internationally, and even from school to school within countries. Providing school food that meets nutritional guidelines or standards is complex21,22. Some countries provide school meals for all their students23, regardless of their socio-economic environment24, whilst in other jurisdictions the responsibility lies with the individual school25. Other factors that contribute to the complex provision of school food include ensuring canteens make a profit26 and organisational implications for principals27; for example, contracts between food operators and schools, agreed based on the provision of catering infrastructure in schools28.

Critical stakeholders involved in the implementation of food based guidelines are supply-side stakeholders29,30 i.e. food service directors, catering managers and staff, school management, programme coordinators and contracted catering suppliers. Some of the factors related to implementation in schools include: difficulties associated with preparing and serving fresh food at school; inadequate canteen facilities29,30; spending excessive time completing funding applications31; and the requirement of staff training around the food guidelines20,30,31. Positively, in contrast, caterers in the UK found the food standards relatively easy to achieve32. However, there has been little synthesis of this research, particularly from the perspective of supply-side stakeholders.

Developing and improving strategies to increase supply side stakeholders conformity of school meal standards requires a comprehensive understanding of the factors that enable and hinder implementation. One such framework that can allow us to apply theory to comprehensively identify factors that need to be addressed is the Theoretical Domains Framework (TDF). The TDF was developed from 128 theoretical constructs from 33 theories that were perceived to be most relevant to implementation questions33. It was first published in 200534 but later validated in 2012 (version 2 (v2)). It has been used in numerous reviews to understand barriers and facilitators to a wide variety of behaviours35,36. Such reviews include implementation of dietary guidelines in early childhood education centres in Australia37 and barriers and facilitators to the implementation of physical activity policies in schools38. The framework (v2) provides 14 domains, which can capture a range of factors that influence implementation outcomes. These include knowledge, skills, memory, attention and decision processes, behavioural regulation, social/professional role and identity, beliefs about capabilities, optimism, beliefs about consequences, intentions, goals, reinforcement, emotion, environmental context and resources, and social influences39.

A number of studies have identified various factors, however, to the best of our knowledge, there has been no previous systematic review undertaken in this area. Seward and colleagues’ systematic review analysed the implementation of dietary guidelines, however this was in relation to childcare services40. Given this evidence gap, the primary aim of the systematic review is to collate the factors that influence the implementation of nutrition or food standards for school food provision in primary and post primary settings (children aged 5–18 years). The use of the TDF will ensure a comprehensive range of implementation factors are examined. Using a theory provides a strong foundation for policy development, in contrast to simply identifying the barriers and facilitators41. Understanding these factors from a theoretical perspective will provide a list of modifiable factors to target. This will help to inform future planning, improve uptake and practice of standards. Essentially, this review can guide policy makers, researchers and individuals responsible for devising and implementing nutrition standards in schools.

Review objectives

The primary objective is to identify and synthesise the existing evidence on the barriers and facilitators to implementing food or nutrition standards for school food from supply-side stakeholders. A secondary objective may include comparing the barriers and facilitators between a primary and post primary school setting.
Methods

This mixed methods systematic review is registered with the international database of prospective systematic review; Prospective Register of Systematic Reviews (PROSPERO): CRD42019117904 (25th June 2019). The Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols (PRISMA-P) checklist has been assessed in the preparation of this protocol (see Reporting guidelines)\(^4\). The review will be conducted in accordance with PRISMA statement guidelines.

Study eligibility criteria

The PICOS acronym (Population, Intervention, Comparison, Outcome and Study design) will be used to select study criteria, as described below. PICOS was selected due to achieving a comprehensive search with greater sensitivity than specificity\(^4\).

Population. To be eligible for this review, studies have to include data which focuses on stakeholders who have a role in the implementation of nutrition or food standards or guidelines for school food within primary and post primary school settings. This refers, but is not limited to catering management and staff, school principals/managers, contracted catering suppliers, food service directors and managers, programme coordinators. It will also include studies that allude to officials from government organisations that may influence food provision in schools e.g. policy makers. As this is an international review and to avoid differences that exist from country to country, e.g. age, all types of primary and post primary schools will be included (Junior, Elementary, Middle, Secondary, Senior and High school). Standards in pre-schools and third level settings will not be included. Furthermore, studies involving school children’s perceived barriers and facilitators will also be excluded.

Intervention. We will include studies of interventions delivered in educational establishments where the standards for school food have been implemented on a voluntary or mandatory basis. This includes food and nutrient standards for all meals and snacks provided in schools. There will be no restriction on the type of standard i.e. nutrient and food based standards will be included. Studies on school nutrition polices and healthy eating interventions will not be included, unless such policies and interventions are based on school meal standards. Similarly, studies on health promoting schools will not be included unless data specific to school based standards can be extracted.

Control. Whilst no comparator is being studied in this review, studies will not be excluded on the basis of having a comparator or control group.

Outcome. The primary outcome will include any barrier or facilitator to the implementation of nutrition and food based standards for school food. For this review, we will use a similar definition that Kerins et al. applied in a systematic review protocol\(^4\). A barrier is defined as any variable that impedes or obstructs the implementation of nutrition standards, whereas a facilitator is defined as any variable that eases and promotes the implementation of nutrition standards. The findings will include the following: (i) verbatim quotations from research participants; (ii) excerpts, quotations or entire passages from studies using documentary analysis; (iii) narrative descriptive summaries of results; and (iv) statistical analyses from surveys and questionnaires. A secondary outcome may include comparing the barriers and facilitators between a primary and post primary school setting.

Study design. We are conducting a mixed method systematic review, therefore quantitative, qualitative and mixed method studies will be accessed. The rationale for this choice is to capture a comprehensive understanding of the factors that affect implementation. This may include, but is not limited to, the following studies which use appropriate methods of data collection and analysis (i) qualitative studies; case studies, grounded theory, ethnography, action research studies (ii) quantitative studies; case control studies, quasi-experimental studies, randomised controlled trials, cross sectional studies and (iii) mixed methods (combining qualitative and quantitative methods of data collection and analysis); focus groups, interviews, surveys, questionnaires, observation. This review will disregard editorials, commentary and opinion pieces.

Language. There will be no restriction on language.

Publication year. There will be no restriction on publication year.

Search strategy

A search of peer reviewed literature combining, where possible, published search filters for school meals, barriers or facilitators, will be undertaken. Guidance of an experienced librarian and discussion amongst the review team will also take place to inform the strategy. Broad search terms will be used to garner greater sensitivity than specificity so as to ensure a comprehensive search is undertaken\(^4\). Databases relating to various fields, including education, food, and nutrition will be used. Each search strategy will be database specific and will include applicable elements such as Medical Subject Headings (MeSH) (or equivalent), truncation, Boolean operators and will be adapted where appropriate. Initial scoping searches will be undertaken by the lead review author to refine the search strategy. Table 1 illustrates a sample search strategy for the CINAHL database. The following electronic databases will be searched: PubMed, CINAHL, Scopus, EMBASE, PsycINFO and Web of Science. To identify published government reports and other grey literature, searches through Google Scholar, Open Access Theses and Dissertations, OpenGrey, RIAN, ETHOS, ProQuest, WorldCat, Networked Digital Library of Theses and Dissertations, and public health organisation websites will also be undertaken. Furthermore, this minimises the influence of publication bias. To identify any additional studies, the reference lists of all included studies will be screened to retrieve additional eligible articles\(^6\). All search results will be reviewed for eligibility, except in the case of Google Scholar where the first 200 citations will be screened. A priori decision to screen the first 200 hits on Google Scholar, as sorted by relevance, was decided after considering the time required to screen each hit\(^6\). The lead or corresponding authors for all included studies will be contacted (via email with
two attempts) so as to identify on-going or unpublished research studies that may be relevant to this review. To ensure that the search strategy is undertaken in a systematic way, a memoing method will be used to record the working notes when conducting preliminary searches as well as documenting the protocol-driven search strategy.47

Study selection

Data management. EndNote X9 will be used to manage references throughout the review. Once the searches have been carried out, the search results will be exported to EndNote. This will identify any duplicates, which will then be removed.

Screening. Search results will be imported into an online systematic review software, Rayyan. This will enable screening, data extraction and quality assessment. This will be undertaken after a piloted, clear and detailed set of inclusion and exclusion criteria has been drawn up (see Extended data). The lead author will screen study titles and abstracts to decide whether the full text manuscript should be retrieved. For screening reliability, a second review author will assess a random sample of 20%. Kappa statistics will be used to assess inter-rater reliability, with values of 0.75 and higher representing high agreement. Each study will be categorised into (a) potentially meeting the eligibility criteria or (b) not meeting the eligibility criteria. For all potentially eligible studies, full text manuscripts will be obtained. A full-text screening process will then commence by two independent reviewers, which will then produce a final set of papers to be included in the review. In situations where the study eligibility cannot be resolved via consensus, a third independent reviewer will be consulted. A flow diagram will be completed to record the numbers of papers through each stage of the search and screening process, as recommended by the PRISMA guidelines.39

Data extraction. Two review authors, not blind to author or journal information will independently extract from all the full text studies that fulfil the inclusion criteria, using a data extraction form. To ensure validity and reliability, a pilot be will undertaken to allow the review authors to compare data extraction and implement modification, if required. Data to be extracted will include, but is not limited to, the following: (a) key study information, (b) a coding manual with definition for each of the 14 TDF constructs (c) new themes (d) the quality assessment criteria. Key study information will include author(s), title, year of publication, country, language, study type (qualitative, quantitative and mixed methods), study design (education setting/school type), participant characteristics (principal, catering staff, catering provider), sample size, data collection and analysis methods. Data on the factors affecting implementation will be extracted from the results and discussion sections of the included studies. This will include exact participant quotes, excerpts, quotations or entire passages from studies using documentary analysis, narrative descriptive summaries of results and statistical analysis from surveys and questionnaires. If any discrepancies arise during this process, they will be resolved through discussion with a third reviewer.

Quality assessment/risk of bias

Quality appraisal will be conducted by two independent reviewers, using the Mixed Methods Appraisal Tool (MMAT) (2018 version). This assessment tool was selected as it is used to efficiently appraise the most common methods and methodologies i.e. qualitative, quantitative and mixed methods studies, with few generic quality criteria.60,53. Additionally, the tool was designed to appraise the methodological quality of studies in a mixed methods systematic review and not the quality of report writing.52 The MMAT focuses on methodological criteria and includes two screening questions and nineteen questions corresponding to the following five categories of study design; qualitative research, randomized controlled trials, non-randomized studies, quantitative, observational descriptive, and for mixed methods studies.60,53. For each study type, reviewers will quality score using a MMAT table. When disagreements between reviewers cannot be easily resolved, a third independent reviewer will be required and a will be reached consensus reached post discussions.

Data synthesis

Barriers and facilitators reported to influence implementation will be synthesized using the TDF. This framework can allow us to apply theory and comprehensively identify factors that need to be addressed.54 The TDF includes 14 theoretical domains synthesized from 33 behaviour changes theories and 128

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**Table 1. Sample CINAHL title and abstract search strategy.**

<table>
<thead>
<tr>
<th>Search number</th>
<th>Search string</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>recommend* OR guideline adherence [mh] OR guidance* OR protocol* OR nutrition policy [mh] OR strateg* OR standard* OR nutrit* OR health promotion [mh]</td>
</tr>
<tr>
<td>#2</td>
<td>school lunch* OR school meal* OR canteen* OR food services [mh] OR school food OR menu planning [mh] OR food program* OR school* meal* program* OR school dinner*</td>
</tr>
<tr>
<td>#3</td>
<td>school*</td>
</tr>
<tr>
<td>#4</td>
<td>#1 AND #2 AND #3</td>
</tr>
</tbody>
</table>

*Mh MeSH headings*
Theoretical constructs in a single framework\textsuperscript{35}. The framework is recommended for use to identify barriers and facilitators to implementation. It has been widely applied in evidence synthesis\textsuperscript{35,36} and has confirmed validity and reliability\textsuperscript{37}. Using a deductive process, factors which influence the implementation of school meal standards will be assigned to the relevant TDF domain according to definitions outlined by Cane et al.\textsuperscript{35}. Inductive thematic analysis, using the Braun and Clarke model\textsuperscript{39} will also be used to code any data that does not fit into the TDF. This ensures all factors will be documented. A review author will assign the identified factors to the TDF domains using the domain definition manual. Any discrepancies will be resolved by the review team, and if necessary by a third reviewer. In addition, for quantitative studies, the frequency in which factors were reported will also be stated.

Study status
This study has not yet commenced.

Discussion
The internal school food environment is considered to have a significant influence on student’s food consumption\textsuperscript{40}. It is believed that over 35% of their energy is obtained at school\textsuperscript{41}. Moreover, in many instances a school meal may be the only complete meal that students have access to\textsuperscript{42}. In response to the need of schools to play a more supportive role in obesity prevention\textsuperscript{43}, many jurisdictions have implemented policies and practices, one of which is food or nutrition standards for school meals\textsuperscript{13,64}.

It is believed that the UK has the most comprehensive set of nutritional standards for school meals. However, the implementation of these standards has not necessarily resulted in better consumption and nutritional outcomes\textsuperscript{44}. Therefore, it is important to evaluate the process, to aid the full implementation of nutrition standards. Implementation evaluation measures the results from a process\textsuperscript{45} and enables the transformation of policy plans into action\textsuperscript{46}. However there are many individual, environmental and socio cultural factors that can affect the successful implementation of policies\textsuperscript{47}. This is particularly pertinent to schools which are complex, with numerous factors that can influence implementation\textsuperscript{48}, the quality of implementation and the expected outcomes of the policy\textsuperscript{49}. The use of the TDF provides a holistic approach as it considers the complex interaction of the how and why\textsuperscript{50}, which must be taken into account when considering how nutrition standards for school meals are implemented in school settings.

Given the potential impact that school meal guidelines and standards can have on the health and wellbeing outcomes of children and adolescents, understanding the factors that affect their implementation is key. This mixed methods review will address this evidence gap and will provide a comprehensive account of the barriers and facilitators that affect the implementation of school meal standards. To the best of our knowledge, this is the first systematic review of this type, and that uses the TDF. We are confident that the depth of this review will provide a holistic understanding of the factors as all types of studies; qualitative and quantitative or both, including grey literature, will be accessed. Furthermore, there will no language or publication date restrictions. The review will follow academic rigour and will include a number of strategies for validity, reliability and to reduce the effects of bias. This will be achieved by having clear and detailed inclusion and exclusion criteria, independent reviewers, the use of PRISMA guidelines, a MMAT, and by using computer packages for data and quality management. Finally, where deviations from this protocol occur, this will be justified and discussed in the systematic review upon publication and will be documented on PROSPERO.

The outcomes of this study will be applicable to policy makers and their advisors, practitioners, researchers and school administrators responsible for supporting the implementation of nutrition standards. Documenting barriers is necessary to improve the implementation of policy changes\textsuperscript{51}. Furthermore, a theoretical based framework will be used, which will provide a greater insight into the complexities of implementation. It will also have the capacity to steer future developments and implementations.

When completed, the review results will be submitted for publication to a peer reviewed journal with the potential of writing a policy brief targeted at key stakeholders. Where applicable and accepted, findings will be disseminated and communicated at conferences, workshops, seminars, and via social media.

Data availability
Underlying data
No underlying data are associated with this article.

Extended data
Open Science Framework: Barriers and facilitators to the implementation of nutrition standards for school food: a mixed methods systematic review, https://doi.org/10.17605/OSF.IO/6Q24P\textsuperscript{42}.

This project contains the following extended data:
- Supplementary File 2. Inclusion and Exclusion Criteria. pdf

Reporting guidelines
Open Science Framework: PRISMA-P checklist for ‘Barriers and facilitators to the implementation of nutrition standards for school food: a mixed methods systematic review’, https://doi.org/10.17605/OSF.IO/6Q24P\textsuperscript{42}.

Data are available under the terms of the Creative Commons Zero “No rights reserved” data waiver (CCO 1.0 Public domain dedication).
References


18. Urdnisiis RI: Zakon o solski prehrani (ZSolPre-1), Ljubljana, 2008. Reference Source


Open Peer Review

Current Peer Review Status: ?

Version 1

Reviewer Report 21 May 2020

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This is an interesting and well thought through concept for a systematic review. I am not an expert in systematic review methodologies and therefore cannot comment in great detail on that aspect. Overall, the rationale is clear, I have a few wider comments for the authors to consider for this review.

Objectives:

- The authors have a primary objective to identify and synthesise the existing evidence on the barriers and facilitators to implementing food or nutrition standards for school food from supply-side stakeholders. Would you please clarify the term supply-side stakeholders: does this include school caterers, headteachers, school business managers, and canteen staff too?

- The authors also mention a secondary objective may be included to compare the barriers and facilitators between a primary and post-primary school setting. I think this objective should be included from the outset - primary schools are very different settings to secondary schools/academies and will be an important aspect of the review to reflect this in the analysis and discussions.

Population:

The authors are excluding studies that involve school children’s perceived barriers and facilitators – is it possible to give a rationale for excluding children’s perceptions?

Intervention/Methods:

If possible, if the authors could provide some clarification on the following points about the intervention that would be helpful. The authors note they will include studies:

- Where interventions delivered in educational establishments and school food standards have been implemented on a voluntary or mandatory basis.

- No restriction on the type of standard i.e. nutrient and food-based standards will be included.
And the international span of countries
How do the authors intend to explore/take into account the effect of the difference between voluntary and mandatory on barriers/success of implementation – these are quite different approaches to implementation.
Similarly, food and nutrient-based standards vary globally re requirements/complexity – how will country effect be captured in review? Both complexity of standards and variation by country may well influence the barriers/success of the implementation of standards.
While there is a clear overview/outcome of data extraction for the qualitative component I am unclear about the outcome for the quantitative aspect, is it an effect on nutrition, children’s diets, etc. A bit more clarification for the quantitative outcome is required.

Is the rationale for, and objectives of, the study clearly described?
Yes

Is the study design appropriate for the research question?
Yes

Are sufficient details of the methods provided to allow replication by others?
Yes

Are the datasets clearly presented in a useable and accessible format?
Not applicable

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Public Health Nutrition, children’s dietary intake, policy evaluation of school food and nutrient standards

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.