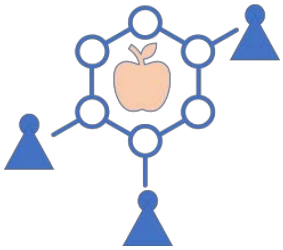

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Population interventions to improve diet in England:

An evidence synthesis on the effectiveness of mandatory, voluntary and partnership approaches

Protocol version 02-12-2020

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Background and Scientific Rationale

Description of the problem

Despite significant commitments in England and globally, non-communicable diseases (NCDs, such as cardiovascular diseases, a range of cancers, and diabetes type II) continue as the leading cause of death and disability, warranting effective solutions. A central risk factor for the high burden of NCDs is poor diet. This evidence synthesis focuses on the effectiveness and cost effectiveness of population interventions to improve diet, with a view to informing more effective responses to poor diets in England.

It is difficult to overstate the role that poor diet plays in human ill-health, made worse by a strong social gradient in access to healthy foods and in diet-related diseases. [1] Poor diet is now estimated to be responsible for more deaths than any other risk globally. [2] This is also true for the UK, with diet driving the major chronic diseases currently faced by the population, estimated to be the largest contributor to overall disease [3] and to have the highest impact on the NHS budget. [4]

Much of this is because high fat, sugar and/or salt (HFSS) foods are often inexpensive, easily accessible, highly promoted and therefore highly consumed. Most of the salt consumed by the UK population is already in the foods people purchase. [5] The consumption of free sugars by adults accounts for 16–17% of their total energy intake, [6] more than triple the 5% maximum recommended by the WHO. [7] Intake of free sugars fail to meet the recommendations in all age groups, with poor diet starting at a very young age. [6] Toddlers consume suboptimal fruit, vegetables and fibre, and this worsens along the social gradient [6] as with adults.[8] Poor diet during preschool years has been associated with poorer school attainment, and both dietary patterns and diet-related disease have been shown to track from childhood into adulthood.[9]

It is in this context that countries such as England are implementing population interventions to promote diets which are health-promoting, support physical wellbeing, and reduce diet-related NCDs, by reducing consumption of energy-dense, nutrient-poor foods such as free sugars, salt, saturated and trans fats, and increasing consumption of fruit and vegetables, lean protein and other nutrient-dense foods.

In response to poor diet and diet-related disease in England, the Government has over the years introduced a range of interventions to improve diet for the whole population. Population interventions to improve diet can be designed in a range of ways, and here we broadly categorised them as: (1) mandatory interventions (public regulation with no involvement of private sector actors); (2) public-private partnerships (public and private sector organisations collaborate in the establishment of collective initiatives to improve health); and (3) voluntary mechanisms (whereby the private sector designs and monitors its own standards of conduct). (These are further explained in the next section on the Description of the intervention.)

Though all three types of interventions have demonstrated varying degrees of effectiveness and therefore potential, there are also risks and challenges to all, with studies indicating that they are not yet optimally designed and/or implemented to meet public health goals.[10-11] A population intervention to improve diet will be most successful if underpinned by clear accountability, monitoring and evaluation processes, as well as a stated public health objective and sufficient political will to sustain it in the face of resistance. For example, a tax on saturated fat was implemented in Denmark in 2011 but was rapidly repealed; it was introduced to raise public revenue

rather than to meet clear public health objectives, and as such was found to have few supportive policy makers. Later studies showed that it had a rapid positive effect in changing consumer behaviour.[12] Voluntary mechanisms and public-private partnerships often lack in accountability and oversight mechanisms; moreover they often do not include the most effective interventions, or well-defined, evidence-based, quantitative targets which push partners to go beyond 'business as usual' and require them to demonstrate progress against the targets, nor do they sufficiently involve the public in the development and monitoring of the interventions. [13]

It will be essential to understand how different policy instruments are meant to work in theory. This evidence synthesis will lead to sub-categorisations of approaches which cut across different governance arrangements: for example incentive-based mechanisms can be employed in mandatory or partnership arrangements (e.g. SDIL vs the Responsibility Deal), but be quite different in their construction i.e. be driven by different actors and motivated by incentives of a different nature. For example the SDIL establishes a clearly defined incentive to act (with manufacturers needing to reduce sugar in products by a certain date, at the risk of costing them a certain amount if this is not achieved); the Responsibility Deal was also an incentive-driven mechanism yet the parameters of that incentive were far less clearly outlined. Thus we categorise interventions first in terms of governance arrangements to enable an understanding not only of impact of effectiveness, but also the implementation and monitoring issues that contribute to their impact. We believe this to be a major added value of the review. Governance is a key overlooked mechanism in these interventions and reviews of these interventions, and it is a key part of the context which is rarely discussed. We are confident that studies identified in the systematic review will help to throw light on whether and how governance has an impact on effectiveness, by understanding what factors relating to interventions, providers, populations and settings affect implementation of such population interventions to improve diet.

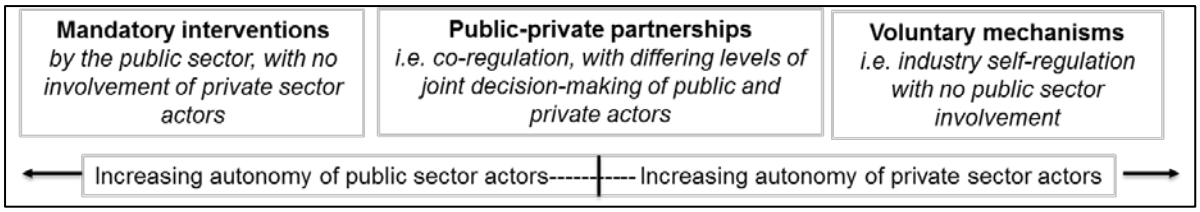
This evidence synthesis assesses the evidence of effectiveness of these population interventions with a view to informing more effective responses to poor diet in England. We will review the different types (mandatory, voluntary, or partnerships) of population interventions to improve diet, and examine implementation, effectiveness, and cost-effectiveness, and factors influencing effectiveness.

Description of the intervention

Over the past decade, the effectiveness of a range of population interventions to improve diet has been evaluated. Those with most long-term promise are those targeting upstream determinants of poor health, aiming to improve conditions and opportunities, so that the majority of the population can eat healthily. [14-15]

As illustrated by Figure 1 below, population interventions can be driven by different types of actors and designed in various ways, ranging from mandatory interventions (where action is required by government and regulated by public authorities), to public-private partnerships (collaborative efforts primarily between private industry and government actors but also including other actors), to voluntary mechanisms (which are industry-led and without involvement from the public sector). This evidence synthesis will assess the effectiveness of all three types of population interventions, and here below we look at each of these in turn.

Figure 1. Taxonomy of engagement between the public and private sectors



Source: adapted from Risse and Boerzel [16]

A mandatory intervention entails public regulation with no involvement of private actors other than as observers or contributors to consultations. It is an initiative, rule or action by government in which participation is required and there is public sector enforcement.[17] Examples of mandatory policies to improve diet in England include the School Food Standards where maintained (state-funded) schools are legally required to meet certain goals to make school meals healthy. Compliance with the School Food Standards is mandatory for all maintained schools. Since 2014 the government has also made compliance with the standards an explicit requirement of funding agreements with all academies and free schools.[18] Provision of improved school food has had a demonstrable impact on diet and nutrition beyond the school dining room and the school gate, benefiting children from all socio-economic groups.[19] Another example is the current Soft Drink Industry Levy (SDIL), where manufacturers of soft drinks who do not reduce the amount of sugar in their drinks are taxed. The SDIL was announced by the government in March 2016 and came into force in April 2018. [20] It is an important part of the Government's plan to reduce obesity [21] and also prevent non-communicable diseases associated with excess sugar consumption. [22] The SDIL has led certain members of the soft drinks industry to reformulate products to contain less sugar in order to reduce their liability to pay the levy.[23-24] Early estimates suggest that the SDIL will be particularly beneficial to improving health and decreasing health inequalities. [25-26] Mandatory population interventions are generally the most effective but may be politically or commercially unacceptable. [12,27] Regulatory attempts to reduce consumption of harmful commodities are often met with opposition from producers and marketers of those commodities, and those stakeholders have been shown to use common strategies in resisting the introduction of such upstream regulation.[28]

Public -private partnerships: Population interventions can be neither entirely mandatory nor voluntary, but with formalized agreements entailing a degree of oversight from a public body, such as a government department of health. These arrangements are most usually referred to as public-private partnership (PPPs), involving public and private sector organisations (to varying degrees) in the establishment of collective initiatives to improve health. [13] A PPP in health involves collective work between at least one private for-profit organization with at least one public (not-for-profit) organization to jointly share efforts and benefits, with a common commitment to a health outcome. [29] PPPs can be a promising middle option between industry led voluntary mechanisms, which is argued to lack sufficient oversight, and mandatory interventions, which can be effective but politically contentious. [30] The rationale for PPPs is that health problems and their solutions should involve all key stakeholders, and that these mechanisms may be cheaper, quicker alternatives to introducing and monitoring legislation, and may help to harness the private sector's efficiency, cost-saving and expertise to help achieve public health nutrition goals. [31] However, the fundamental purposes of being in PPPs may diverge significantly between the public and private sectors. [32] For public sector partners, PPPs can be a way to supplement funding for research on diet. For private sector partners, PPPs open opportunities to promote their brand and image, and present themselves

as legitimate actors in the policy-making processes. [33] While PPPs have had some success in other fields, particularly in the field of environmental policy, [13] some evaluations have shown limited positive impact of PPPs in diet improvement. [10,34]

Examples of PPPs to improve diet in England include the Public Health Responsibility Deal, where food and other industries worked with the then Department of Health to improve public health outcomes for the population in England. [35] Another example of a policy driven by the public sector but relying on voluntary actions by the private sector is the Sugar Reduction and Reformulation Programme driven by Public Health England, encouraging rather than forcing industry to reduce sugar in their products. [36]

Voluntary mechanisms entail actions by the private sector to create and/or enforce their own initiatives or rules, with no public involvement.[17] Examples of self-regulation or voluntary agreements to improve diet in England include codes of conduct set out by the UK Advertising Standards Authority, the self-regulatory organisation of the advertising industry in the UK, which agree cross-industry ways to protect children from advertisements for high fat, sugar and salt products. Voluntary approaches can be effective.[13] However, there are also risks and challenges to voluntary agreements, with studies indicating that in their current formats, voluntary agreements to improve diet are usually based on vague commitments, focused on easy but ineffective approaches (such as information sharing), and often hampered by limited monitoring and reporting, generating poor data. [10]

Rationale for the current study

To the best of our knowledge this would be the first comparison of evidence of effectiveness of voluntary, mandatory and partnership approaches to improving diet. It is also the first review that attempts to synthesise evidence to help us understand the theories that underpin these different approaches, and the implementation and monitoring issues that contribute to their impact.

In 2013 we conducted a scoping review of voluntary agreements and their success criteria. The scoping review was an important start but an incomplete exercise in that it was not a comprehensive, systematic review, and it was not specifically focused on diet. Moreover, and crucially, it only reviewed the evidence of effectiveness of voluntary agreements. Finally, the review was published in 2013, and an update of the latest literature is now warranted.

As noted below in the section on the size of the literature, other reviews exist on specific intervention types (e.g. voluntary agreements), and on the effectiveness of interventions to address specific aspects of the diet (e.g. comparisons between mandatory and voluntary approaches to reducing consumption of trans fatty acids [37]). However, we do not know of any review examining the evidence on the effectiveness of these different intervention approaches to improving diet through the same lens.

Given the range of population interventions to improve diet in England, and the urgent need to resolve the disease burden related to poor diet, it is now essential to understand the effectiveness of different arrangements, levels and types of involvement of the public and/or private sector in improving diet, and what we can learn from the literature about how these could be made more effective at improving diet in England.

Research aim and questions

Aim

To search systematically for, appraise the quality of, and synthesise evidence on the effectiveness of population interventions to improve diet, including mandatory interventions, voluntary mechanisms and public-private partnerships (M-V-PPP), and to share the evidence synthesis, and formulate recommendations to improve interventions, with stakeholders with a view to informing more effective responses to poor diet in England.

Research questions

1. How are mandatory interventions, voluntary mechanisms and public-private partnerships to improve diet assumed to work in theory?
2. What mandatory interventions, voluntary mechanisms and public-private partnerships to improve diet, and reduce inequalities in diet improvement, have been evaluated?
3. What factors relating to interventions, providers, populations and settings affect implementation of such population interventions to improve diet?
4. Have such population interventions improved process, impact (intermediate and distal) and cost outcomes?
5. Are there any reported unanticipated effects of such population interventions?
6. What is the cost effectiveness of such population interventions?
7. How can the findings of the evidence review be translated into recommendations for improved interventions?

Methods

Overview of the review's components

This review includes six inter-linked components, which are identified in orange and red in Figure 2. Information about each component is summarized in Table 1 on the next page.

Figure 2. Methods overview and the corresponding research questions

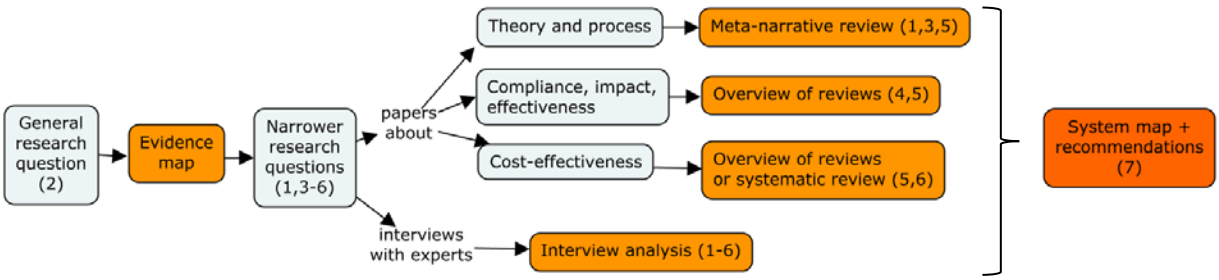


Table 1. Summary of review components

Components	Research questions	Detail
Component 1 Systematic evidence map	2	Includes primary research evaluations and literature reviews. **Objectives:** i) document the breadth of the literature, research trends and research gaps, ii) inform the next stages of the review.
Component 2 Interview analysis	1-6	Interviews with experts (conducted in Jan-April 2020, prior to the project starting), with the analysis focusing on theory, conception, implementation, impact, cost-effectiveness. **Objectives:** i) identify additional relevant interventions, ii) inform the review's methods further, complement the findings, and inform the final workshop
Component 3 Meta-narrative review of process and mechanisms	1,3,5	Based on the systematic evidence map. Includes the evaluations that provides information on how M-V-PPP diet-related policies work. **Objective:** to critically assess how M-V-PPP diet-related policies work in theory and in practice, including the factors that influence their process from their conception to their implementation, impact and effects.
Component 4 Overview of reviews on compliance, effectiveness, and impact	4-5	Using the most up to date, comprehensive and rigorous systematic reviews on compliance, impact and effectiveness identified in the systematic evidence map. **Objective:** to critically assess the compliance, effectiveness and impact of M-V-PPP diet-related policies.
Component 5 Overview of reviews on cost-effectiveness or systematic review	5,6	Using the most up to date, comprehensive and rigorous systematic reviews on compliance, impact and effectiveness identified in the systematic evidence map. **Objectives:** i) to critically assess the cost-effectiveness of M-V-PPP diet-related policies, ii) to identify factors that make some interventions more cost-effective than others.
Component 6 Stakeholder consultation	7	**Objectives:** i) integrate all the findings together into a system map, ii) stakeholders' workshop to reflect on how to translate findings into recommendations.

Component 1. Systematic evidence map

Overview

RQ: 2

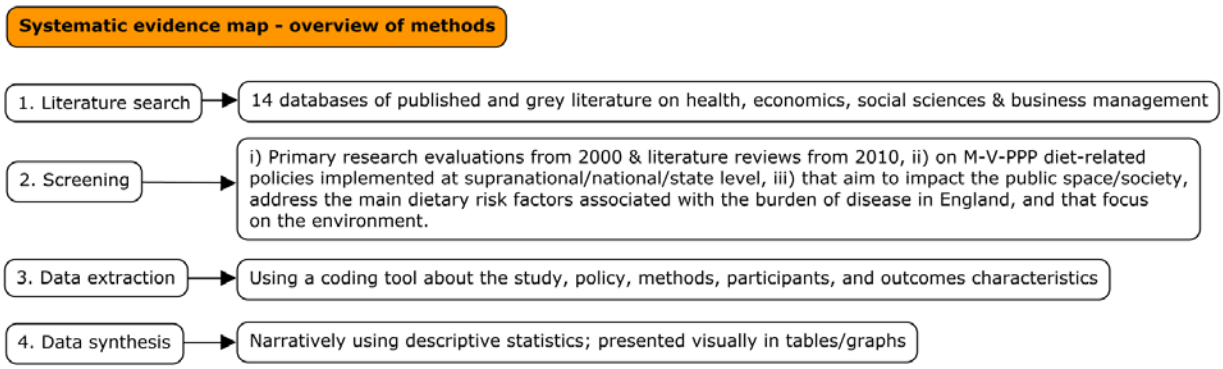
Publication 1: the systematic evidence map

Objectives

1. To identify the breath, purpose, and extent (including trends and gaps) of research on M-V-PPP diet-related policies
2. To identify relevant evaluations to be analyzed further in the next components.

Methods

Figure 3. Overview of methods for the systematic evidence map



Eligibility criteria and screening

Primary research evaluations and literature reviews (systematic and relevant non-systematic reviews) on diet-related policies that focus on governance, the environment, and that are conducted at supranational, national or provincial/state level will be considered for inclusion. The full eligibility criteria are detailed in table 2. Records will be uploaded to the software Eppi-Reviewer for the removal of duplicates, screening, coding (data extraction) as well as for part of the synthesis. Screening will be performed by teams of two independent reviewers. Before the reviewers perform it on their own, pilot screening of successive batches of 100 titles and abstracts will be conducted against the eligibility criteria to test the wording and the reviewers' understanding of the criteria; this until reaching batch-level agreement of a minimum of 90%. The reviewer teams will discuss conflicting findings together, and call in a third reviewer to discuss disagreements where necessary. Full texts will be obtained for references that have met the inclusion criteria or where information in the title and abstract is insufficient to make a judgment. Screening of full texts will be conducted in the same manner as above. Studies in English, French, Spanish, Danish, Norwegian and Dutch, as well as abstracts in Mandarin will be directly used by the review team since at least one of the team members speaks one or more of these languages. For abstracts in other languages, we will ask for translation support from within our institutions and networks, which are highly international and diverse. Eligible full texts will also be translated although this will depend on the resources available.

Table 2. Eligibility criteria for the evidence map and related review components (2, 4-6)

Parameter	Inclusion criteria	Exclusion criteria	Rationale
Study designs	**Primary research:** evaluations **Literature reviews**; Must have searched at least 2 databases and mention eligibility criteria.	- Reviews that have no methods at all or that don't meet the inclusion criteria; - Theoretical papers; - Conference abstracts, working papers; - Commentaries, viewpoints, editorials, letters - Websites, blogs, podcasts, book reviews.	- Focus on evaluations to answer RQ 3-6; - Basic criteria for a review to be 'systematic' and avoid extremely high risk of bias.
Publication date	**Primary research :** 2000 and onwards **Literature reviews:** 2010 and onwards	Primary research published before 2000. Literature reviews published before 2010	- 2000 because commentaries, reports and international workshops introduced the concept of PPPS in public health inthat year, eg: www.who.int/intellectualproperty/topics/ppp/en/ These mainly focused on vaccination and medication. Papers on the governance of diet-related policies that focus on the environment are likely to be rare before 2000. - 2010 for literature reviews: To capture evidence that is relevant for the current policy context.
Language	All languages.	None	The search terms will only be in English. We will ask colleagues to screen and/or translate relevant publications that are in languages that are not understood by any member of the team.
Population	Anyone	None	
Policy topics & settings	Policies that: - Are from anywhere in the world AND - Aim to impact the public space or society in general AND - Aim to address the main dietary risk factors associated with the burden of disease in England AND - Focus on the environment.	Policies that are - Directed to individuals (e.g. behaviour change, education, treatment); - On undernutrition, the double/triple burden of malnutrition, food fortification, food supplementation, agriculture, and food safety & hygiene; - Not targeting "ordinary" food as presented in the Eatwell guide (NHS 2019), e.g. "natural" products, supplements, energy drinks, alcohol, fortified & functional foods, GMOs, and not intended to be sold to the general public (e.g. emulsifiers)	Focus on food that represent the majority of a regular diet in England and that are relevant for decision-making in England due to the nature of the funder (NIHR).

Parameter	Inclusion criteria	Exclusion criteria	Rationale
		- For a workplace and their staff; - Specific to patients in a healthcare institution; - About research collaboration as a topic	
Policy level	Policies that have been implemented at the: - Supranational - National - Provincial/state level	- Policies not implemented yet (e.g. projection studies, experimental studies in non real-life environment); - Policies that are implemented at the local level only (e.g. initiative by a city or institution)	- To inform decision-making at "national" level in England. - To also learn from initiatives developed at the provincial/state level in countries where power to design policies are at this level.
Governance approach or mechanism	- Mandatory by a public authority - Voluntary private-led code/guidance. Private actor must be for-profit or associated with a for-profit organisation - PPP involving at least one public and one private actor. Private actor must be for-profit or associated with a for-profit organisation - Does not mention a clear approach but at least one clear governance feature (e.g. clear targets)	PPP in which the private actor is not related to a for-profit organisation directly nor indirectly (ie genuine non-for profit/voluntary organisation)	This review aims at informing England regarding policies that involve public and/or and private-for-profit actors
Outcomes	- Intermediate (e.g. on products characteristics, food environment & consumer) - Distal (on diet & diet-related health) - Inequalities - Costs - Process - Unintended consequences	- Not about health (e.g. feasibility to reduce salt content in cheese) - Food hygiene	This review includes several outcomes related to health. Note that differentiating primary vs secondary outcomes is not relevant for complex reviews (Petticrew, 2015)

Search strategy

The publications will be searched in the 14 following databases:

Table 3. Databases used for the literature search

Database	Platform	Research tradition*
ABI/INFORM Global	ProQuest	Business & management
Campbell Collaboration	Campbell Collaboration	Education, crime and justice, social policy (SRs only)
Cochrane Library	Cochrane Library	Health
EconLit	Ovid	Economics
EMBASE	Ovid	Health
Epistemonikos	Epistemonikos	Health (SRs only)
Medline	Ovid	Health
PsycINFO	Ovid	Psychology & mental health
- Science Citation Index Expanded - Social Sciences Citation Index - Arts & Humanities Citation Index - Conference Proceedings Citation Index- Science - Conference Proceedings Citation Index- Social Science & Humanities - Emerging Sources Citation Index	Web of science (searched all together)	Social sciences and humanities

** these are relevant for the meta-narrative review*

The literature search will be structured around the following concept: (mandatory OR PPP OR voluntary) AND policy AND diet. Combinations of single search terms, blocks of words (e.g. "public-private partnership") and MeSH terms will be used to ensure that robust, transparent and consistent searches are run across the different databases. However for some concepts, only free-text terms will be used despite having a MeSH term: for example, the MeSH term "self-regulation" refers in some databases to self-regulation of behaviours by individuals e.g. related to food consumption, rather than self-regulation of actions by the food industry. We are only interested in the latter definition. In each database, up to eight major or 'semi-final' search lines will be conducted depending on the availability of MeSH terms (five where there is no MeSH term at all) and be combined to generate the final results. Each semi-final line will deconstruct the concept "M-V-PPP + Policy + Food" in a different manner. For instance, the first consists of the MeSH term "food legislation", which encompasses several mandatory food-related policies. The second and third major lines combine a series of terms related to mandatory policies (e.g. law, taxation) with a series of terms related to food. The sixth line combines four categories of words together: terms related to governance, actors (public and private), policy, and food. The final search will then be limited by year (2000+). The searches will also be limited by publication format when several thousands of results will be found (ABI-INFORM, Embase, Medline, and the six databases in Web of Science). Where possible, illegible formats will be excluded (e.g. NOT letters, editorials, etc); otherwise eligible formats will be selected (e.g. articles, reviews). The full search strategy used in Medline and explanations for each semi-final line is presented in Appendix 1.

To build the search strategy, numerous individual keywords, MeSH terms, truncations and Boolean terms were tested to verify their scope either individually and/or combined with other terms. For instance, the word “Act” was considered to identify policies but discarded because of its omnipresence due to the verb “to act”. “Menu”, “Portion size” and “serving size” were added to capture policies on these that are not described in titles and abstracts using food or nutrient terms. Regarding truncation, tax* was removed because it also includes “taxa”, which is highly used in the biochemistry literature. Instead we will be using tax, taxes, taxed, taxation and taxing. The use of AND vs ADJ5, as well as ADJ5 vs ADJ4 were also compared to verify what they include and exclude and balance sensitivity with precision. Furthermore, while the word “regulat*” is necessary to identify policies and governance, it is also widely used in the biochemistry, pharmacology and agriculture literature. This leads to the identification of several thousands of irrelevant records. To address this noise, several free and MeSH terms about genetics, microbiology, pharmacology, as well as irrelevant nutrition fields (e.g. food hygiene) will be excluded using the Boolean operator “NOT”. To ensure that the latter process does not exclude relevant articles, the search strategy was tested in Medline, Embase and PsychInfo using 38 papers: the first 30 primary research papers and the eight literature reviews that were listed in our initial protocol as potentially eligible papers and published in or after 2000. Note that the exclusion criteria have been revised since, meaning that some of these papers have become ineligible. Table 4 summarises the tests with the 38 articles in the three databases. The platform Web of Science does not use MeSH or thesaurus terms and produces several thousands of results. Therefore, only free terms can be excluded with “NOT”, which is not sufficient. To help reducing the number of irrelevant papers about agriculture, microbiology, genetics and pharmacology, we will select the relevant fields using the Web of Science categories (e.g. any category about health, food, social sciences; not engineering nor agriculture.

In addition to searches in the databases, we will scan the reference lists of the studies that will meet our inclusion criteria for the map, and contact experts to help us identifying missing publications and unpublished data on population interventions to improve diet. These will include :

- the authors of relevant systematic reviews protocols for which no publication about the results can be identified. The protocols for which no final publication will be found until the end of the review will be classified as “Reviews awaiting assessment” (as per Cochrane Handbook’s guidance);
- the steering committee members;
- we will search the literature that was mentioned in the interviews conducted with researchers prior to this review.

Table 4. Tests to retrieve 38 articles with the search strategy

Database	Medline	Embase	PsychInfo
N not available in the database	1	1 (same as Medline)	21
N retrieved	31	27	5
Reasons for non-retrieval	- 4 not eligible (2 about policies at local level, one about diabetes programmes, one not about governance); - one uses "foods/beverages" as the sole keywords for diet in the title and abstract, and the sign "/" is not supported by the platform Ovid.	- Same 5 as Medline - 3 additional ineligibles (one about education, a modelling study testing fictive scenarios; a study protocol that might produce relevant results but for now does not mention links with governance); - One mistakenly categorised as about genetic heterogeneity and therefore excluded with "NOT".	2 not eligible (one at local level, one not about governance).
N articles retrieved vs total available and potentially eligible	31/32	27/28	5/5 One article could not be retrieved while it was in Medline and Embase, probably because of the lack and/or different content of MeSH terms. A few keywords related to supermarkets were added to the free terms about food to capture it as well as additional potential papers.

Data extraction

Two reviewers will independently extract data from included studies using a coding tool (table 5) in Eppi-Reviewer. Similarly to screening, the concept of batch "coding" with a minimum 90% agreement rate will be used. The coding tool was designed to encompass the heterogeneity of study methods and topics and was inspired by tools used in other systematic reviews, overviews of reviews and systematic evidence maps. We will extract information on: i) basic study characteristics (e.g. publication year, location, design, aim); ii) policy intervention characteristics (e.g. level, policy area, aim, governance approach, setting, target population); iii) study participants; iv) study outcomes. The coding tool will be first piloted and adjusted using a small number of papers. Reviewers will also have

the possibility to develop additional codes where relevant. At this stage, due to high number of publications that will be included in the map, unless data is incoherent or there are clear signs of potential errors, missing data will be noted as such rather than contacting authors and extracting information from primary studies included in literature reviews. An additional code will be used to identify conceptual papers and theoretical papers on the governance of diet-related policies. These are excluded from the map but will be the focus of component 3 (narrative review of theories).

Quality assurance initiatives for screening and data extraction will be conducted at three different levels by:

- using the double-screening and double-coding process.
- contacting authors and verifying primary studies when information seems to be reported inadequately.
- conducting data cleaning verifications, such as ensuring that all the included papers have codes for each of the essential characteristics, that no excluded paper is coded, and that the papers do not include contradictory codes including more than one code when the guidance states to select only one.

Table 5. Coding tool for the systematic evidence map

Characteristics	**Codes in Eppi-Reviewer Web**	**Guidance and sub-codes**
Basic study characteristics	Authors	*Extracted by default in Eppi-Reviewer*
	Publication year of study, review or CP	*Tick one year, e.g. 2017*
	Study design – *tick one:* • Primary study evaluation (including policy analysis) • Literature review	***Further coding…*** ***If a primary study:*** *a) Study design of study (primary study) - tick one:* ▪ No study design filter ▪ Interventional studies ▪ Observational studies ▪ Natural experiments or intervention not manipulated by the researchers ▪ Qualitative studies ▪ Other (specify with free text) ***If a literature review:*** *a) Type of synthesis - tick one:* ▪ Meta-analysis ▪ Summative synthesis (narrative synthesis of quantitative data, eg 3 reviews did X, without further reference to narrative synthesis) ▪ Qualitative evidence synthesis ▪ Mixed-methods synthesis with meta-analysis ▪ Mixed-methods synthesis without meta-analysis ▪ No synthesis (just lists the findings one after the other)

Characteristics	Codes in Eppi-Reviewer Web	Guidance and sub-codes
		▪ Other (specify with free text) *b) Study design of primary studies included - tick all that apply:* ▪ No study design filter ▪ Interventional studies ▪ Observational studies ▪ Natural experiments or intervention not manipulated by the researchers ▪ Qualitative studies ▪ Other (specify with free text) c) N of primary studies included: *Tick one number (e.g. 9) OR "*Unclear/Not reported"
	Country focus as mentioned in the title or methods of study or review	*Tick one:* ▪ A single country or two ▪ A specific world region (e.g. continent, group of islands) ▪ High income or OECD countries only ▪ Middle income countries only ▪ Low income countries only ▪ Both L and MICs only ▪ No country filter applied/Not reported ▪ Other
	Geographical location of study, or primary studies in review	*Tick all the continents and countries where the interventions were conducted, e.g. Europe; France and UK.* *The categories will be based on the United Nations methodology.* *Add option: N/A (CP only)*
	Verified country classification of study, or primary studies in review	*Tick one (using the 2020 World Bank classification):* ▪ High income only ▪ Middle income only ▪ Low income only ▪ Both LMICs only ▪ Combinations of both High and LMICs ▪ Unclear/Not reported ▪ N/A (general CP)
	General aim of study or review	*Tick all that apply:* ▪ To assess/document the **process** (conception, implementation and/or effect) of a governance approach or policy, or people's views about it ▪ To assess/document **the compliance, effectiveness or impact** of a governance approach or policy, or people's views about these ▪ To assess/document the **cost-effectiveness** of a governance approach or policy, or people's views about it ▪ Other (specify with free text)
Policy intervention	Governance approach(es)	*Tick one option:* ▪ Mandatory approaches only ▪ Voluntary approaches only

Characteristics	Codes in Eppi-Reviewer Web	Guidance and sub-codes
	assessed in study or at review level	▪ PPPs only ▪ Combination of M-V-PPP ▪ Not specified but at least one governance assessed
	Types of actors involved in the policy/ies assessed study or at review level	*Tick all that apply:* ▪ Supranational institution ▪ Public institution – national level ▪ Public institution – state/province level ▪ Public institution – other (specify) ▪ Private sector – food production or transformation ▪ Private sector – food retailers ▪ Private sector – media, advertising & marketing (not specific to food) ▪ Private sector – other (specify) ▪ Voluntary sector ▪ Other (specify)
	Level of policy assessed in study or at review level	*Tick one:* ▪ Supranational only ▪ National only ▪ State/province only ▪ Supranational, national and/or state/province only ▪ Local level as well (e.g. specific city or organisation) ▪ Unclear or N/A (e.g. CP)
	Policy area(s) and sub-area(s) assessed in study or at review level	*Tick all that apply (based on NOURISHING framework):* ▪ *N (Labelling) – tick all that apply:* - Front-of-pack - Menu - Other ▪ *O (Food standards in schools and other settings) – tick all that apply:* - Schools - Other settings (specify) ▪ *U (Use economic tools) – tick all that apply:* - Sugar tax - Fat tax - Salt/sodium tax - Free school meals - Coupons/discounts for vulnerable populations - Other ▪ R (Restrict food advertising) – *tick all that apply:* - On TV (children only) - Online (children only) - Other ▪ I (products reformulation / reduction progs) – *tick all that apply:* - Sugar - Trans-fat - Salt/sodium

Characteristics	Codes in Eppi-Reviewer Web	Guidance and sub-codes
		▪ S (Incentives in shops; location & prices) ▪ H (Supply chain and provision; NOT agriculture) ▪ Other ▪ Unclear or N/A (e.g. general CP)
	Aim of policy/ies assessed in study or at review level	*Tick one option:* ▪ Increase physical access to products ▪ Decrease/ban physical access to products ▪ Increase affordability of products ▪ Decrease affordability of products ▪ Increase knowledge, skills, or attitudes ▪ Decrease/ban exposure to advertising ▪ Reduce energy/nutrient content ▪ Ban a nutrient ▪ Other (specify with free text)
	Setting(s) assessed in in study or at review level *Tick all that apply:* ▪ Restaurants / takeaways ▪ Shops/markets ▪ Schools ▪ Media other than retail sector ▪ Other (specify with free text) ▪ No setting filter / target (review only) ▪ Unclear or N/A	***Further coding – tick all that apply:*** ▪ ***If restaurants/takeaways (tick one)*** - On premises - Online - Both on premises and online - Unclear/Not reported ▪ ***If shops/markets Online (tick one)*** - On premises - Online - Both on premises and online - Unclear/Not reported ▪ ***If school – a) school type (tick one)*** - Primary schools only - Secondary schools only - Various or other types of schools - Unclear/Not reported ▪ ***If school – b) food service type (tick one)*** - Cafeterias only - Vending machines only - Various or other types of food services - Unclear/Not reported ▪ ***If media other than food retail sector (tick one)*** - TV for children - Websites for children

Characteristics	Codes in Eppi-Reviewer Web	Guidance and sub-codes
		- Various or other types of media - Unclear/Not reported
	Target population of the policy/ies assessed in study or at review level	*Tick all those that apply:* • No specific population filter / target • Children • Pregnant women & young families • Other (specify with free text) • Unclear or N/A
Study participants in study, CP or at review level	*Tick all that apply:* • No specific population filter / targeting • Specific population group • Food and drink products • Adverts • Other (specify with free text) • Unclear or N/A	***Further coding…*** ***If specific population group - Tick all those that apply:*** ▪ Adults from general population ▪ Children from general population ▪ Vulnerable pregnant women & young families ▪ Government actors ▪ Catering services staff ▪ School staff other than catering services ▪ Food & drink staff (not retail) ▪ Retail staff (shops) ▪ Marketing, advertising & media staff (not directly from the above) ▪ Other (specify with free text)
Type of outcomes measured	*Tick all those that apply:* • Process • Compliance, effectiveness or impact • Cost-effectiveness or analysis • Other (specify)	***Further coding… Tick all those that apply:*** ***If Process*** ▪ Rationale or factors relating to the choice of a governance approach ▪ Implementation processes (barriers, facilitators…) ▪ Process explaining the effect/impact of the policy ▪ Unanticipated effects (free text) ▪ Inequalities related to above (free text) ▪ Other ***If compliance, effectiveness or impact: association or change in…*** ▪ Knowledge, skills, attitude & awareness ▪ Food and drinks product characteristics ▪ The environment offering or promoting products ▪ Diet-related behaviours (e.g. reading labels, purchases) ▪ Food/nutrient intake or status (5 a day, sugar) ▪ Health & disease (BMI, metabolic indicators) ▪ Unanticipated effects (free text) ▪ Inequalities related to above (free text) ▪ Other ***If cost effectiveness or analysis – analytical perspective*** ▪ Health sector ▪ Societal ▪ Both health and societal ▪ Unanticipated effects (free text)

Characteristics	Codes in Eppi-Reviewer Web	Guidance and sub-codes
		▪ Inequalities related to above (free text) ▪ Other ▪ Unclear

Data synthesis

Data will be analysed by characteristics as well as by looking at associations between these. Since this is a map, the key features of the reviews will be synthetized narratively using descriptive statistics and presented visually in tables/graphs using Eppi-Reviewer and Excel. Both the data extraction and synthesis will also be informed by the views of the public advisory group and we will comment on whether the latter is aligned with the literature.

Component 2. Interview analysis

Overview

***This work was not funded by the NIHR, and conducted prior to the project starting, but designed to inform this review.

RQ: 1-7

Publication 2: the interview analysis

Rationale for conducting interviews

Evaluations of population interventions are not always reported in the published or grey literature, and so it will be important to speak to individuals having experience in designing, implementing and/or evaluating different types of population interventions to improve diet in England, to ensure we are including all relevant information in our review. Given the range of population interventions to improve diet in England, it is essential to understand the motivations for choosing, and the risks and benefits of designing, implementing and managing, different types of population interventions to improve diet.

Objectives of the interviews in relation to the NIHR evidence review

1) helping identify the key current and recent population interventions to diet in England and abroad to ensure that we have identified the appropriate and complete list of interventions and/or relevant studies; and
2) inform the review's methods further, complement the findings, and inform the final NIHR workshop, by identifying some of the key drivers and challenges related to different types of population intervention.

Types and recruitment of stakeholders

We sought to interview a range of experts and policy-makers – approximately 30 in all - who have experience designing, implementing, and /or evaluating population interventions to improve diet in England, with a good balance between voluntary agreements, mandatory approaches, and

partnerships. With the fact that practitioners, civil servants and policy makers were increasingly occupied with the growing COVID-19 epidemic, we reached out to academics in the field.

Topic guide

- key current and recent population interventions to diet in England and abroad; existing studies or data on the above; key resources, and
- reasons for choosing certain interventions (driven by evidence? Political expediency? Etc); risks and benefits of designing, implementing and managing, different types of population interventions to improve diet

Analysis

A total of 16 interviews were conducted with academic experts in xx countries. Thematic coding will be used to analyse the findings. The codes will be driven by the key objectives i.e. centred on the issues of motivations for choosing certain interventions, risks vs benefits, challenges of implementation (e.g of a voluntary agreement with food industry) and so forth.

Component 3. Meta-narrative review of theories and mechanisms

Overview

RQ: 1,3,5

Publication 3: the meta-narrative review

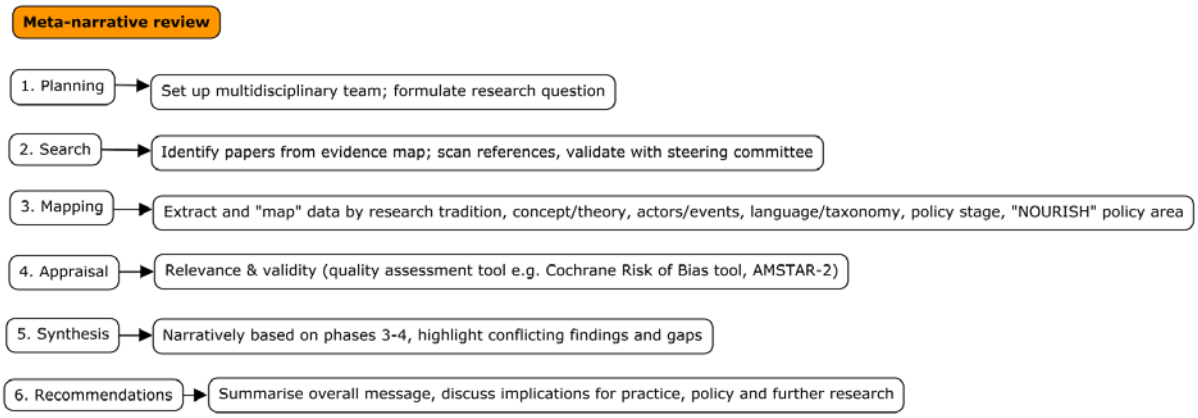
Objective:

To document and critically appraise how M-V-PPP diet-related policies work in theory and in practice, including the factors that influence their process from their conception to their implementation, impact and effects.

Methods

The meta-narrative review will be based on the methods initially developed by Greenhalgh et al (2004) and recent developments. The concept and methods of meta-narrative review are used to "unfold" the "storyline of research in a particular scientific tradition", ie to document theories as well as research analyzing or testing these from different fields ("research traditions") and through time. In the case of Greenhalgh and colleagues, they applied this method to the concept of sustainability in health services, which led to the development of the theory of Diffusion of Innovations in Service Organizations. The approach consists of six general steps: 1. Planning phase; 2. Search phase; 3. Mapping phase; 4. Appraisal phase; 5. Synthesis phase; 6. Recommendation phase. These are summarized in Figure 4 below.

Figure 4. Overview of methods for the meta-narrative review



Planning phase

This phase is nearly completed. It consists in creating a multidisciplinary research team that covers "research traditions" that are expected to be relevant for the review. Our team includes researchers with backgrounds in evidence-base medicine & nutrition sciences, health promotion, public policy, economics, studies of organizational process, context and culture, and complexity studies. Together we also have experience in diet-related policies from the local to the supranational levels. The steering committee includes people from similar research traditions as well as human behaviour and marketing. The public advisory group will provide their views as members from the general public regarding the role of the public in national diet-related policies.

The specific research question for the review is: "how do mandatory, voluntary and PPP policies related to diet work, including the factors that influence their process from their conception to impact. The anticipated outputs are the identification of mechanisms and characteristics that may vary (or not) across governance approaches, policy subareas and context. The research question and anticipated outputs will be discussed with the steering committee and public advisory group.

Search phase

The literature search for evaluations will already have been conducted as part of the systematic evidence map. Potentially eligible papers for the meta-narrative review will be identified in the systematic evidence map with one of the two groups of codes below. Papers that are misclassified in the evidence map will be checked by a second reviewer and recoded appropriately.

- General aim of study or review → To assess/document the process (conception, implementation and/or effect) of a governance approach or policy, or people's views about it
- Type of outcomes measured → process

Conceptual papers and theoretical frameworks published from 2000 and that focus on the governance of diet-related policies will be searched in the databases listed below using key words related to governance, policy and diet. These are the databases that were used for the systematic evidence map and that were filtered by publication format to identify evaluations. This time, the following

publication formats will be selected: commentary/comment and book. Furthermore, potentially relevant publications that will have been identified for this review when conducting the systematic evidence map will be checked (see Component 1; Data extraction).

Databases:

- ABI/INFORM Global
- Embase
- Medline
- Science Citation Index Expanded
- Social Sciences Citation Index
- Arts & Humanities Citation Index
- Conference Proceedings Citation Index- Science
- Conference Proceedings Citation Index- Social Science & Humanities
- Emerging Sources Citation Index

Lastly, we will scan the reference lists of the papers that meet the eligible criteria, ask the steering committee to identify missing papers, contact experts who have published on the subject, and/or who have published conference proceedings which may lead to unpublished data or theories, and search the citations of the publications that provide substantial relevant information for the review as per evaluation in the Appraisal phase below.

The publications will be screened against the two following eligible criteria:

- They present a theory, a primary research process evaluation (including qualitative research on stakeholders' views), or are a literature review of process evaluations or concepts relevant to the latter;
  AND
- They provide information on how diet-related M-V-PPP policies work, whether it is about their conception, implementation, effects or impacts.

The new eligible evaluations (both primary research and literature reviews) will be added to the systematic evidence map.

Mapping phase

We will first identify the research traditions present in the papers included using the list of research traditions listed in Greenhalgh et al 2004 (table 1) as a starting point. In each research tradition, two independent reviewers will then extract information on (excerpts taken directly from Greenhalgh et al 2004 are presented in *italic*):

a. *They key elements of the research paradigm (conceptual, theoretical, methodological, instrumental)* as well as information on specific mechanisms and characteristics.
b. The key actors and events in the unfolding of the tradition (including the main findings and how they were discovered).

c. *The prevailing language and imagery used by scientists to "tell the story" of their work.* (including the words related to governance such as mandatory, voluntary and PPP)
d. The policy stage (conception, implementation, effect, impact)
e. The policy-area based on the NOURISHING framework (Appendix 2). The policy areas that meet the eligibility criteria of the overarching research project (table 2) are: N (Labelling), O (food standards), U (economic tools), R (advertising), I (shops), S (external built environment), and H (food supplies).

In the case of missing or unclear information, we will contact the authors for detail. If we do not hear back from them within one month, we will record the information as missing and this will be considered in the appraisal phase. Furthermore, some papers might include information on aspects that do NOT meet the eligibility criteria of the overarching project (e.g. a literature review that has a broad scope and includes some studies on food safety). Information that do not meet the eligibility criteria will NOT be mapped and their exclusion will be noted.

Appraisal phase

Each paper will be critically appraised for its validity and relevance to the review question by two independent reviewers. "Relevance appraisal" will be based on the knowledge and impression of the reviewers. "Validity appraisal" will be conducted using a tool according to the study design. The results will be extracted and then collated by comparable studies.

- **Randomized trials:** Cochrane Risk of bias tool
- **Non-randomized trials and observational studies:** Cochrane ROBINS-I instrument
- **Qualitative studies:** Cochrane Critical Appraisal of Qualitative Research
- **Economic studies:** Consolidated Health Evaluation Reporting Standards (CHEERS)
- **Quantitative systematic reviews:** slightly modified version of AMSTAR-2. Similarly to Dickson et al 2019, changes were made so the tool can be used with any quantitative systematic and not only those of intervention studies (see detail in Appendix 3)
- **Other literature reviews (qualitative, mixed-methods and not typical systematic reviews):** Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Systematic Reviews and Research Syntheses (presented in Appendix 4)
- **Policy analyses and theoretical papers:** TBC

Synthesis phase

We will first assess how different population intervention types (mandatory interventions, voluntary mechanisms, or public-private partnerships) are presented and defined in the included studies in order to contribute to existing taxonomies of such interventions and policy mechanisms. We will then conduct a narrative synthesis and qualitative analysis of how these mechanisms are meant to work in theory. For each dimension, we will:

a) Summarize narratively the contribution (where relevant) of each research tradition;
b) Highlight conflicting findings and explain them by considering the study characteristics (based on the evidence map and additional categories where needed), quality appraisal, *and the different paradigms from which the data were generated*.

Meta-ethnographic methods [77] might be employed to synthesise qualitative data, help to draw connections between the findings, and for example, analyse why certain population interventions may be acceptable or effective in certain settings, and not in others. The meta-ethnography will follow Noblit and Hare's seven steps to propose new interpretations (and potentially new theories) from the qualitative studies [78] namely

1. Getting started i.e. determining a research question that could be informed by the qualitative research;
2. Deciding what is relevant to the initial interest including defining the focus of the qualitative research synthesis and refining inclusion criteria;
3. Reading the studies i.e. extracting relevant themes and concepts from the studies under review;
4. Determining how the studies are related i.e. critically organising the themes and concepts into categories of how they are related;
5. Translating the studies into one another i.e. going beyond comparing and contrasting papers' themes and concepts to systematically exploring the influence of various contextual factors, for example, what were the reported drivers of an intervention's design?;
6. Synthesising translations i.e. translating themes and concepts in tables, having each review team member independently develop an overarching model that link together the translations; and comparing, contrasting and merging the models to generate hypotheses;
7. Expressing the synthesis i.e. the hypotheses generated by the synthesis process of how interventions might be improved.

Recommendation phase

Through reflection and multidisciplinary discussion within our research team as well as with the steering committee and public advisory group, we will:

a) Summarize the overall messages from the literature
b) Distill and discuss recommendations for practice, policy and further research

Component 4. Overview of reviews on compliance, effectiveness and impact

Overview

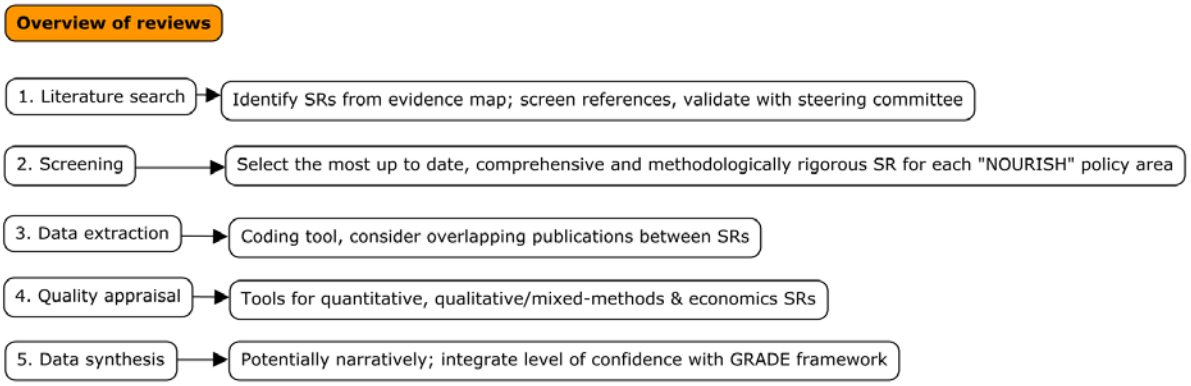
RQ: 4,5

Publication 4: Overview of reviews on compliance, effectiveness, and impact

Objective: To assess the compliance, effectiveness, and impact of mandatory, voluntary and PPP diet-related policies.

Methods: This review will be conducted using the most up to date, comprehensive and rigorous systematic reviews on compliance, impact and effectiveness that will be identified in the systematic evidence map. Figure 5 presents an overview of the methods for this overview of reviews.

Figure 5. Overview of methods for the overviews of reviews (component 4 and potentially 5)



Literature search

The literature reviews available on the topic will be identified using the two codes below in the systematic evidence map coding tool. These codes also present the inclusion criteria for this overview of reviews.

- General aim of study or review → To assess/document the compliance, effectiveness or impact of a governance approach or policy, or people's views about these
- Type of outcomes measured → compliance, effectiveness or impact

Papers that are misclassified in the evidence map will be checked by a second reviewer and recoded appropriately. We will also scan the reference lists of the papers that meet the inclusion criteria, and ask the steering committee members if there are any missing review that they are aware of. All new eligible review will be added to the systematic evidence map.

Screening

For this overview of reviews, we will be using the literature reviews that are the most up to date, comprehensive and methodologically rigorous. This is in order to make the most of reviews that are the most useful (and time-efficient) to answer the research question rather than including all of them including those that are older, narrower in scope and/or of lower methodological quality. This judgment is based on the Value of information approach (REFS) and inspired by the criteria that have been proposed by Tugwell et al (2020) for deciding when and when not replicate systematic reviews (which also follow the Value of information approach). Since evidence on compliance, effect and impact is likely to vary by the type of policy assessed, we will first sort the literature reviews by policy area based on the NOURISHING framework (appendix 2). The categorisation will already have been done as part of the evidence systematic map. The policy areas from the framework that meet the eligibility criteria of the overarching research project (presented in table 2) are: N (Labelling), O (food standards), U (economic tools), R (advertising), I (shops), S (external built environment), and H (food supplies). We will then select the most up to date, comprehensive and methodologically rigorous

literature reviews for each policy area. There will not be a maximum of literature reviews to include for each policy area. The selection will start with the review that will be judged as the most "useful", ie most up to date, comprehensive and methodologically rigorous; then each subsequent review be judged for their "added value" to the reviews that will already be included. A tool to select reviews and document the process will be developed closer in time around the characteristics below.

- **Up to date:** Publication date of the literature review as well as the policies and evaluations included, with questions relating to whether these reflect the current policy and evidence context
- **Comprehensiveness:** The scope of the review in terms of geographical location, types of policies, participants (or products/environments) and outcomes assessed, as well as relevance to governance.
- **Methodological rigour:** Appraised with AMSTAR-2 for quantitative systematic reviews with the same modifications as for the meta-narrative review (appendix 3), or the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Systematic Reviews and Research Syntheses (appendix 4) for the other literature reviews (qualitative, mixed-methods and not typical systematic reviews)

Data extraction

General review characteristics will already have been extracted for the systematic evidence map. Additional data will be extracted in Eppi-Reviewer by two independent reviewers using a coding tool that will complement that for the systematic evidence map. Prior to use, the coding tool will be piloted by the two independent reviewers on a sample of papers and refined accordingly. Like for the meta-narrative review, information on characteristics that do NOT meet the eligibility criteria of the overarching project (table 2) will not be extracted but their exclusion will be documented. Furthermore, we will verify potentially inadequate, lacking, or contradictive information reported in the literature reviews in the primary studies that they refer to.

Quality assurance initiatives for screening and data extraction will be conducted by:

- using the double-screening and -coding process.
- by verifying primary studies when data seems to be reported inadequately, including when data about the same study differ across different reviews.
- by conducting data cleaning verifications, such as ensuring that all the papers included in the overview have codes for each of the essential characteristics, that no paper excluded from the overview has codes for the latter, and that the papers do not include contradictory codes including more than one code when the guidance is to select only one.

Quality assessment

Quality assessment at the review level will already have been conducted as part of the screening process. The quality of evidence will then be assessed for each outcome: an initial assessment will see evidence produced from randomized trial evaluations assessed as high quality, and evidence which includes observational data rated lower due to confounding. However, this initial ranking will then be reconsidered based on different risks of bias including lack of random sequence generation, lack of allocation concealment, lack of blinding of participants and personnel, lack of blinding of outcome assessment, incomplete outcome data, and selective reporting. Initial ranking will also be reconsidered due to inconsistency, indirectness of evidence, imprecision, and publication bias. Based

on these judgements, a final grade will be assigned before other factors affecting the strength of recommendations are considered. This is essential because high-quality evidence does not always translate into a strong recommendation for going forward with an intervention; other factors to consider are for example preferences of the public for a certain intervention, and the cost of an intervention. We will also employ the GRADE approach [73], a tool used by systematic reviewers for grading the quality of and certainty of evidence for making recommendations. GRADE-CERQual ('Confidence in the Evidence from Reviews of Qualitative research') will be employed for qualitative studies. [74]

Data synthesis

We will synthesise findings by population intervention type, and by study type. Given the nature of this research, the likelihood of having sufficient homogeneity across quantitative studies in order to perform statistical pooling is limited, however we will do so should it be possible. In order to synthesise heterogeneous evidence of intervention impacts on dietary health or on determinants of dietary health, we will adapt the effect direction plot developed by Thomson et al [76] to display non-standardised effects across multiple outcome domains. Heterogeneity in direction of effects between studies will be investigated and transparently reported, as will reflections on the limitations of the synthesis. We note that guidance on the conduct and reporting of narrative synthesis is in development and we will incorporate such guidance into this review should it be made publicly available in time.

Component 5. Overview of reviews on cost-effectiveness (RQ 6)

Overview

RQ: 5,6

Publication 5: Overview of reviews on cost-effectiveness

Objectives

1. To assess the cost-effectiveness of mandatory, voluntary and PPP diet-related policies
2. To identify factors that make some interventions more cost-effective than others.

Methods

The methods will be similar to that of the overview of reviews on compliance, effectiveness and impact (component 4) with the following differences:

- The quality of economic evaluation papers will be assessed using the Consolidated Health Evaluation Reporting Standards (CHEERS). [75]
- To synthesise the economic literature, we will extract intervention type, evaluation method, country setting, time horizon as well as cost and economic outcome estimates from included studies. Cost estimates will be inflated and/or converted, when necessary, using country-specific Gross Domestic Product (GDP) deflator index and Purchasing Power Parity exchange

rates. The extracted data will be presented in a descriptive manner. Measures of costs and cost-effectiveness, by population intervention sub-type, will be summarised using tables. If feasible, outcome estimates from comparable studies will be pooled in a random-effect model meta-analysis to characterise average intervention impacts.

If literature reviews don't provide sufficient details, we will consider conducting a regular systematic review instead.

Component 6. Developing and validating the system map and recommendations for England

Overview

RQ: 7

Publication 6: commentary on the process used to develop the system map and recommendations, and present the final version

Objectives

1. To develop a final system map on governance features and other mechanisms and recommendations to implement key aspects of it in England.
2. To validate the map and recommendations with stakeholders from various fields in England.

Synthesis of the whole project

The synthesis will be organised in terms of how different population intervention types (mandatory interventions, voluntary mechanisms, or public-private partnerships) are presented and defined in the included studies, and how these mechanisms are meant to work in theory and in practice. This would comprise conducting comparisons e.g. of how different policy instruments or mechanisms are deployed in different types of interventions. Comparisons will be done qualitatively, drawing out differences and similarities between the approaches, based on the data, and considering the robustness of that data (i.e. the studies retrieved by the review). The comparisons will by necessity be indirect, as few studies will have directly compared different approaches, but where they have, (if any) this would provide stronger evidence, depending on the quality of the study. Furthermore, we have recently published guidance [79] on taking a systems approach in literature reviews. In this context it means going beyond the "did it work" question, and exploring issues of context that may have affected the effectiveness of the intervention. In parallel with conventional systematic review results tables, the findings will also be organised in terms of 'systems-level questions', e.g. does a certain policy mechanism, such as an incentive, function differently or have a different effect depending on contextual factors (e.g. motivations, drivers, political philosophy driving a certain governance arrangement.) Finally, the key findings will be illustrated visually using a system map approach. The findings will then be discussed with the public advisory group & steering committee before the stakeholder workshop, and adjusted accordingly.

Final workshop with key stakeholders

[From the proposal, to be confirmed given current circumstances]

This activity will take place at the end of the project by February 2022. We will discuss the findings of the evidence review with a group of key stakeholders, formulate recommendations and specifically develop change strategies for better population interventions on diet in England, drawing on the evidence review findings.

The overall purpose of the workshop is interpretive and translational: through structured exercises with relevant stakeholders, we will seek informed perspectives on how to translate review findings into actionable recommendations for policy and practice. Plans for the workshop include the formulation of change strategies where required: this refers to outlining and working through a range of solutions to the design, implementation and other challenges identified in the literature review, and may indeed include a framework for advocacy and implementation.

Specifically we will aim is to test multiple solutions to the challenges identified with regard to the design and/or implementation of existing or future/planned policy interventions to improve diet in England, and focus on specific challenges to do with voluntary, mandatory and/or partnerships aimed at improving diet. The workshop will provide an opportunity for stakeholders to work together creatively and co-design novel solutions to challenges identified above. We will involve the following stakeholders:

Approximately 10 adult members of the public (5 from the general public, and 5 individuals with relevant knowledge through experience) will be recruited with the support of existing local networks and partners as explained below, and aiming to achieve geographical and socioeconomic diversity using the English indices of multiple deprivation [38], as well as representation across protected characteristics. A budget for their time and participation has been included as part of the public involvement component of this proposal. First, in order to recruit general members of the public, we will use the LSHTM press twitter account to advertise this research opportunity. We will also ask other participants for referrals. Second, in order to recruit members of the public with an interest or experience in diet or diet-related disease (approximately 5 individuals), we will engage the following initial list of groups of interest:

- Age UK's older people's forums in England, which enable older people to make their voices heard on key issues, influencing service planning and provision at local, regional and national levels.(https://www.ageuk.org.uk/get-involved/social-groups/forums/);
- parents' groups participating in the Healthy Start programme;
- members of the public participating in local Sugar Smart campaigns (run by Sustain, an organisation dedicated to better food and farming https://www.sustainweb.org/sugarsmartuk/) For example Hackney Council and the Hackney Food Partnership are working together to deliver a local Sugar Smart campaign to reduce excessive sugar consumption in the borough. This involves working with schools, early years, workplaces, community groups, leisure centres and independent cafes and restaurants to raise awareness and take actions to reduce sugar. (https://www.hackney.gov.uk/sugar-smart).
- Finally, there are great opportunities through other projects in which the lead and co-applicants are involved, such as the Co-Create project on adolescent obesity, for which we are in the process of establishing youth alliances on adolescent obesity (in England), in close collaboration with a selection of local authorities.

These provide important opportunities to identify members of the public with varying levels of engagement with the issue of food and diet.

Approximately 50 practitioner and policy experts with experience designing, implementing, monitoring and/or evaluating relevant population interventions will be recruited. We aim to have representation across the country, and across characteristics relevant to diet (most importantly, socioeconomic status) by appealing to our existing colleagues at national and local levels (both governmental and non-governmental), contacting other organisations across England as listed, and ensuring diversity by referring to the English Indices of Multiple Deprivation when selecting potential participants.

We will first reach out to existing networks and from there begin the process of engaging stakeholders across England. For example, as Executive Members of the NIHR School for Public Health Research, MP and ME have extensive access to public health networks across England. These networks include the Equal North network of practitioners and researchers addressing health and social inequalities, which will be expanding into an NIHR SPHR funded 'Equal England' network over the next 18 months (ME co-leads that project).We will also seek to include other key players with knowledge of population level interventions to improve diet, namely:

governmental or arms-length organisation representatives from e.g.

- Public Health England (e.g. individuals involved in the design and implementation of the salt and sugar reduction programmes);
- the Department of Health and Social Care (e.g. those involved in designing the Childhood Obesity Programme, and in the Soft Drink Industry Levy);
- the Department of Education (e.g. those involved in the School Food Standards);
- Local Authority representatives (e.g. the Local Government Association, and public health departments at local authority level);
- National Institute for Health and Care Excellence (NICE) team on diet, nutrition and obesity

The Local Government Association team on public health issues

non-governmental representatives (e.g. Sustain, the Caroline Walker Trust, and others involved in voluntary dietary guidelines for early years settings);

industry representatives (e.g. those involved in voluntary salt, sugar and trans-fat reduction programmes, or from the UK advertising industry regarding self-regulated restrictions on the advertising of HFSS, and OFCOM regarding legislative options)

Researchers on diet and diet interventions in England – who have conducted evaluations (including cost-evaluations) of population interventions for England (e.g. the Centre for Diet and Activity Research (CEDAR) at the University of Cambridge)

The stakeholders at the workshop will directly build on the findings of the literature review, focusing on reported challenges regarding issues such as those related to design, implementation and/or evaluation of interventions, and to test multiple solutions to these challenges. The process of co-designing these, including with members of the public, requires us not to pre-empt what that process might entail at this stage. During the stakeholder workshop, participants will work in small groups to:

- Choose as a group to focus on a set of priority issues emerging from the systematic review, and formulate strategies for change of those identified issues;

- Explore change readiness of institutions, in the current political and economic context – what might be trade-offs, what might be long-term opportunities where immediate change is deemed too difficult;
- Explore the level at which the public should be consulted, and specifically how to more effectively be involved in priority setting, defining research outcomes, and selecting methods and approaches to best improve diet in England;
- Translate strategy into meaningful application, and to formulate what this might entail (risks, benefits, barriers or points of resistance)
- Translate ideas for meaningful application into a 'prototype' of what a modified intervention might look like

There are various ways in which these strategies, intervention prototypes and other findings from the stakeholder workshop process will be reported and disseminated, and these are outlined in the sections below on outputs and dissemination.

Project timetable

The following Gantt chart provides a monthly project timetable showing the scheduling of all key stages of the project, their expected duration, and the timing of key milestones through the project, including the production of outputs. The Gantt chart also identifies the 6-monthly progress reports.

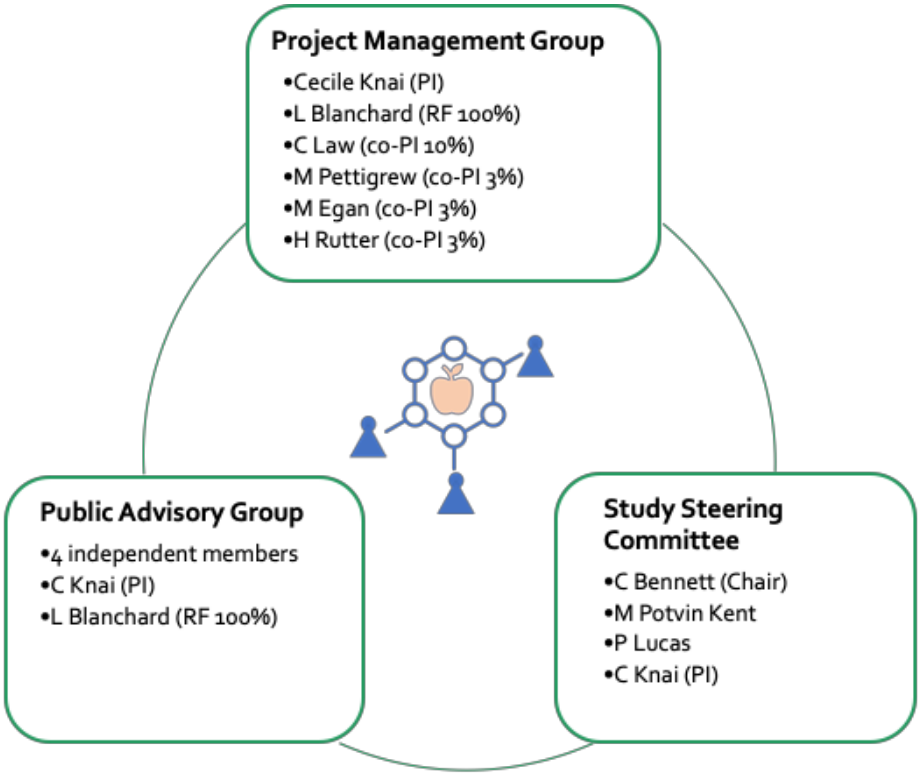
Table 6. Gantt chart

Tasks by project	**Project Year 1**											**Project year 2**								
Year	**2020**						**2021**											**2022**		
Month	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Preparatory tasks																				
Planning																				
Setting PPI and stakeholder grs																				
Tests literature search																				
Develop tool "added value" for C4-5																				
C1 Evidence map																				
Final lit. searches																				
Screening																				
Data extraction																				
Data synthesis																				
Writing paper 1																				
C2 Interview analyses						TBC														
Data analysis						TBC														
Writing paper 2																				
C3 Meta-narrative rev.																				
Planning & search																				
Mapping																				
Appraisal																				
Synthesis																				
Recommendation																				
Writing paper 3																				

C4. Overview of reviews on impact																				
Screening																				
Data extraction																				
Quality appraisal																				
Data synthesis																				
Writing paper 4																				
C5. Overview of reviews cost-effect.																				
Screening																				
Data extraction																				
Quality appraisal																				
Data synthesis																				
Writing paper 5																				
C6. System map																				
Workshop planning																				
Overal synthesis																				
Draft recommendation																				
Workshop early Jan																				
Corrections																				
Writing paper 6																				
MEETINGS																				
Mangmt committee	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Steering committee				X				?						?				?		
Public advisory gr				X				?											?	
Progress reports					X					X						X				
Prepare final report																				

Project management and governance

Figure 6. Project management and governance



Management Committee

Cecile Knai is responsible for the management and delivery of the work. The Head of Department sponsors this research and is Professor Ellen Nolte, Head of the Department of Health Services and Policy, London School of Hygiene & Tropical Medicine.

- Dr Cécile Knai (25% FTE) is the PI and provides scientific leadership and project oversight at all stages of the review. She provides expertise in food and nutrition policy, population interventions, voluntary agreements, and systematic reviews.
- Laurence Blanchard is a full-time (100%) Research Fellow on the project with expertise in conducting systematic reviews, and with a background in food and nutrition. Laurence leads the day to day work, and has designed much of the protocol.
- Dr Cherry Law, Research Fellow, LSHTM (10% FTE) brings expertise in health economics, economic evaluation of food / diet interventions. Cherry leads the review of relevant economic evaluations, and ensures that cost considerations are reflected throughout the research.
- Professor Mark Petticrew, Professor of Public Health Evaluation, LSHTM (3% FTE) brings expertise in systematic reviews (quantitative meta-analyses), policy evaluation, voluntary agreements and will use his time to critically contribute to the literature review and dissemination strategies throughout the project.
- Professor Harry Rutter, Professor of Global Public Health, University of Bath (3% FTE) bring expertise in food and nutrition, and national policy engagement and will use his time to critically contribute to the literature review and dissemination strategies throughout the project.

- Dr Matt Egan, Associate Professor, LSHTM (3% FTE) brings expertise in systematic reviews, and local policy engagement, and will use his time to critically contribute to the literature review and dissemination strategies throughout the project.
- Christine Rivett-Carnac is the project administrator, LSHTM (10% FTE) and supports with project administration and financial reporting.

The co-PIs form a Management Committee which meets monthly throughout the project to critically assess process, progress, deadlines and outputs. These Management Committee meetings are minuted to keep a record of tasks, deadlines and responsibilities.

Study Steering Committee

A Study Steering Committee contributes to shaping the conduct of the research, and the dissemination and translation of the research findings in various forums applicable to different publics. The Study Steering Committee will meet 3-4 times during the project. The PI represents the Management Committee on the Study Steering Committee, and will be sharing progress and any issues arising for advice and guidance.

Table 7. Composition of the Study Steering Committee

Title	First Name	Last Name	Job Title	Name of institution	Membership Type	Independent
Ms	Claire	Bennett	Senior Public Health Manager (Food and Health)	Greenwich Borough	Chair	Yes
Dr	Monique	Potvin Kent	Associate Professor	University of Ottawa	Member	Yes
Dr	Patricia	Lucas	Reader, Child Health Research	University of Bristol	Member	Yes
Dr	Cecile	Knai	Associate Professor of Public Health Policy	London School of Hygiene & Tropical Medicine	Member	No

Public Advisory Group (PPI component)

A Public Advisory Group has been established. It comprises 4 members of the public recruited from the People in Research (NIHR supported) programme. The main objectives of the PAG are to 1) provide a public view on the research (methods, results, dissemination) 2) provide their input on the role of the public in policies to improve diet in England and how this is reflected in our research. A first meeting is planned for end October 2020.

Ethics / Regulatory Approvals

The desk-based review of the literature will not in and of itself require ethics approval as it is drawn solely on evidence already in the public realm.

The final stakeholder workshop will require ethics approval from the LSHTM Research Ethics Committee. We will be inviting participants by email to which we will attach (1) an information sheet outlining the aims of the project, the scope and purpose of the activity, and their rights as participants, including confidentiality, anonymity, and withdrawal from the project; and (2) a detailed agenda for the workshop. Once they have agreed to participate, participants will be asked to sign a consent form at the beginning of the workshop.

In terms of data management, lists of participants will be collected only for administrative purposes i.e. in order to contact those who have agreed to take part, to give them information about participating and the logistics for attending the workshop e.g. time and place. The lists of participants will consist of their first and second names, plus a method of contact i.e. an email address or phone number. These lists will be stored on password protected computers at LSHTM. Audio recordings will be taken (with the consent of participants) using an encrypted digital recorder, held as encrypted files on the LSHTM computer system, and shared (as encrypted files) with a professional transcription company (Way with Words), directly as uploaded files onto their system. The returned transcripts require password access, and are then password protected once received as Word files at LSHTM.

There is no anticipated physical or psychological discomfort or distress expected with participation of policymakers, experts, or the public in this research. As there will be diverse participants, the sensitivity of experience and information shared is acknowledged, however as the topic of discussions are not designed to touch on any specific personal issues, and so it is not foreseen that there will be any disadvantage to particular participants. All individuals and their diverse perspectives and positions will be respected and catered for during the research process.

Dissemination, Outputs and anticipated Impact

We are planning a series of peer-reviewed publications, policy reports and conference presentations on the literature review findings, and the workshop proceedings and conclusions, including change strategies or emerging recommendations. Policy and practice recommendations will be formulated for improving the design and delivery of population intervention to improve diet in England, and specifically any recommended alterations to existing policies, how much they might cost, and how cost effective they are estimated to be. An important impact of this research will be to engage the public in discussions (during the final workshop) about population interventions, and the ways in which the public should be involved.

We will work with stakeholders involved in the study to identify the opportunities for dissemination with greatest impact. This specifically refers to engaging our Steering Committee on the above questions and using existing networks at national and local level, with practitioners and the public, to explore the most appropriate and effective form of, and venues or forums for, dissemination.

Appendix 1: Search strategy for Medline (Ovid)

1	exp Diet/
2	exp Food/
3	beverages/ or exp artificially sweetened beverages/ or exp carbonated beverages/ or exp coffee/ or exp drinking water/ or exp energy drinks/ or exp "fruit and vegetable juices"/ or exp milk/ or exp milk substitutes/ or exp sugar-sweetened beverages/
4	exp Fruit/
5	exp Vegetables/
6	exp Sodium, Dietary/
7	exp Sugars/
8	exp Fats/
9	exp Dietary Fiber/
10	exp Portion Size/ or exp Serving Size/
11	exp Infant Food/ or exp Infant Formula/
12	(Diet or Nutrition or Food or foods or Snack or snacks or Drink or drinks or Beverage* or Soda or sodas or Fruit or fruits or Vegetable* or Salt or Sodium or Sugar* or Fat or fats or fatty acids or TFAs or Fibre or fibres or fiber or fibers or "Portion size*" or "Serving size*" or Menu or menus or Infant formula or infant formulas or baby formula or baby formulas or baby milk or infant milk or artificial milk or breastmilk substitute* or breast milk substitute*).ti,ab.
13	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 *[Food free + MeSH terms]*
14	exp Legislation, Food/ ***[semi-final line 1; for food policies that are clearly mandatory]***
15	(Law or laws or Legislat* or Regulat* or Decree or "Executive order" or Tax or taxes or taxation or taxed or taxing or Levy or levies or levied or "Excise duty" or "fiscal policy" or "fiscal policies" or "fiscal measure" or "fiscal measures").ti,ab. *[terms related to policies that are mandatory]*
16	((Law or laws or Legislat* or Regulat* or Decree or "Executive order" or Tax or taxes or taxation or taxed or taxing or Levy or levies or levied or "Excise duty" or "fiscal policy" or "fiscal policies" or "fiscal measure" or "fiscal measures") adj5 (Diet or Nutrition or Food or foods or Snack or snacks or Drink or drinks or Beverage* or Soda or sodas or Fruit or fruits or Vegetable* or Salt or Sodium or Sugar* or Fat or fats or fatty acids or TFAs or Fibre or fibres or fiber or fibers or "Portion size*" or "Serving size*" or Menu or menus or Infant formula or infant formulas or baby formula or baby formulas or baby milk or infant milk or artificial milk or breastmilk substitute* or breast milk substitute*)).ti,ab. ***[semi-final line 2; 15 adj5 12, for policies that are mandatory + food free terms]***
17	exp Fiscal Policy/ or exp Taxes/
18	exp Government Regulation/
19	17 or 18 *[MeSH terms associated with policies that are mandatory or about governance]*
20	19 and 13 ***[semi-final line 3; MeSH policies that are mandatory + food]***
21	("Public-private partnership*" or "Responsibility Deal").mp. *[terms clearly related to PPPs]*
22	exp Public-Private Sector Partnerships/
23	21 or 22 *[free key words + MeSH clearly about PPP]*
24	23 and 13 ***[semi-final line 4; clearly PPP + food]***
25	(Mandatory or Compulsory or Obligat* or obliged or Voluntary or Option* or Non-compulsory or Non-mandatory or Non-obligatory or Public-Private).mp. *[terms related to governance]*
26	exp Mandatory Reporting/ or exp Mandatory Programs/
27	exp Voluntary Programs/
28	25 or 26 or 27 *[free and MeSH terms related to governance]*
29	exp Nutrition Policy/
30	exp Food Labeling/

31 exp Food Assistance/

32 29 or 30 or 31 *[policies that are clearly about food]*

33 28 and 32 ***[semi-final line 5; governance + food-related policies]***

34 (Government* or Governance or Minist* or Senate or ((National or federal or state or provincial) adj (department or agency or institute))).ti,ab. *[free words related to the national or state public sector]*

35 government/ or exp federal government/ or exp government agencies/ or exp state government/

36 (Industry or industries or Private or Business* or Public-private or Company or companies or Corporat* or Multinational* or Vendor* or Retail* or Shop or shops or Store or stores or supermarket* or Restaura* or Broadcaster*).ti,ab. *[free terms related to relevant private sectors]*

37 exp Food-Processing Industry/ or exp Food Industry/

38 exp Restaurants/

39 exp Food Services/

40 34 or 35 or 36 or 37 or 38 or 39 *[free and MeSH terms about the public and private sectors]*

41 (Policy or policies or Plan or Strategy or strategies or Standard or standards or Scheme* or Program* or Guide or guides or guidance or guidelines or Code or codes or Measure or Measures or Rulebook or Target or targets or Limit or limits or limitation or Reformulat* or Remov* or Restrict* or Prohibit* or Ban or bans or banned or Label* or Population intervention* or population-level intervention* or population-based intervention*).ti,ab. *[free terms frequently used to name diet-related policies]*

42 exp Policy Making/

43 41 or 42 *[free and MeSH terms about policy]*

44 13 and 28 and 40 and 43 ***[semi-final line 6; food + governance + public/private actors + policy]***

45 (Agreement* or Alliance* or Coalition* or Collaboration or Cooperation or "Joint deliver*" or Partnership* or Pledge* or Self-regulat*).ti,ab. *[free terms related to partnership]*

46 ((Agreement* or Alliance* or Coalition* or Collaboration or Cooperation or "Joint deliver*" or Partnership* or Pledge* or Self-regulat*) adj5 (Industry or industries or Private or Business* or Public-private or Company or companies or Corporat* or Multinational* or Vendor* or Retail* or Shop or shops or Store or stores or supermarket* or Restaura* or Broadcaster*)).ti,ab. *[45 adj5 36, to identify partnerships with private actors free terms]*

47 46 and 13 ***[semi-final line 7; partnerships with private actors + food]***

48 ("policy option" or "policy options").mp.

49 48 and 13 ***[semi-final line 8; policy options + food]***

50 14 or 16 or 20 or 24 or 33 or 44 or 47 or 49 ***[combination of the 8 strategies]***

51 exp Pharmacology/

52 exp Food Safety/

53 exp Hygiene/

54 exp Food Hypersensitivity/

55 exp Genetics/

56 exp Toxicology/

57 exp cell physiological phenomena/ or exp genetic phenomena/ or exp microbiological phenomena/

58 exp heterocyclic compounds/ or exp polycyclic compounds/ or exp macromolecular substances/ or exp "hormones, hormone substitutes, and hormone antagonists"/ or exp "enzymes and coenzymes"/ or exp "nucleic acids, nucleotides, and nucleosides"/ or exp complex mixtures/ or exp biological factors/ or exp "biomedical and dental materials"/

59 (Cell* or mitochondr* or enzym* or mononucl* or nucle* or reductase or molecul* or oxydat* or oxidase or homeostas* or overexpress* or phenotype* or embryo* or transcriptom* or PCR or RNA or gene or genes or genetic* or ((calcium or salt or sodium) adj2 ion)).mp.

60 exp animals/ not humans/

61 exp Animal Experimentation/

62 exp Hydrocarbons/

63 exp Forensic Genetics/

64 exp pharmacologic actions/

65 exp plant extracts/ or exp prescription drugs/

66 exp Drug Therapy/

67 exp Biopharmaceutics/

68 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67

69 50 not 68

70 limit 69 to yr="2000 -Current"

71 exp address/ or exp bibliography/ or exp biography/ or exp collected work/ or exp collection/ or exp comment/ or exp congress/ or exp dataset/ or exp dictionary/ or exp directory/ or exp editorial/ or exp guideline/ or exp lecture/ or exp letter/ or exp news/ or exp newspaper article/ or exp overall/ or exp periodical index/ or exp video-audio media/ or exp webcast/

72 70 not 71

Appendix 2: The NOURISHING framework.

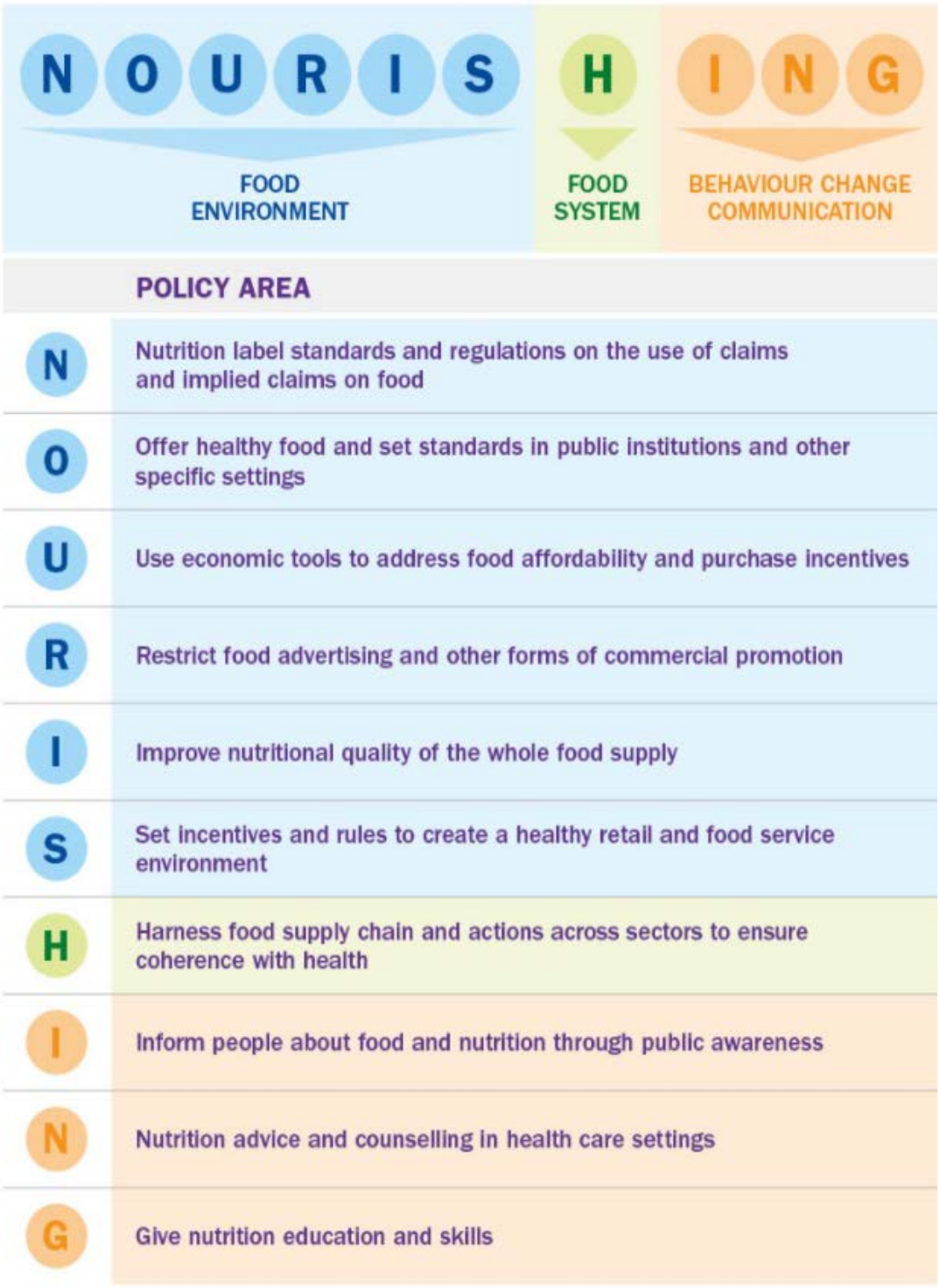


Image taken from World Cancer Research Fund International.
https://www.wcrf.org/int/policy/policy-databases/nourishing-framework (accessed 08-10-2020).

Appendix 3: AMSTAR-2 modified

Question and possible answers	Guidance in AMSTAR-2 (Shea et al, 2017)	Modified guidance	Rationale
1. Did the research questions and inclusion criteria for the review include the components of PICO? *Yes or No*	For Yes: 1. Population, 2. Intervention, 3. Comparator group, and 4. Outcome. Optional (recommended): 5. Timeframe for follow-up (Yes or no)	For Yes: Minimum of I and O - I: Intervention (policy) - O: what are they trying to assess	Controlled studies are unlikely for our type of topic, and the policies generally target the general population without specification.
2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? *Yes, partial Yes, or No*	For Partial Yes: The authors state that they had a written protocol or guide that included ALL the following: 1. review question(s), 2. a search strategy, 3. inclusion/exclusion criteria, 4. a risk of bias assessment For Yes: As for partial yes, plus the protocol should be registered and should also have specified: 1. a meta-analysis/synthesis plan, if appropriate AND a plan for investigating causes of heterogeneity, 2. justification for any deviations from the protocol	No modification	
3. Did the review authors explain their selection of the study designs for inclusion in the review? *Yes or No*	For Yes: the review should satisfy ONE of the following: 1. Explanation for including only RCTs, OR 2. Explanation for including only NRSI, OR 3. Explanation for including both RCTs and non-randomised studies for intervention (NRSI)	For Yes: the review should explain the inclusion of observational studies including natural experiment	
4. Did the review authors use a comprehensive literature search strategy? *Yes, partial Yes, or No*	For Partial Yes (all the following): 1. searched at least 2 databases (relevant to research question), 2. provided key word and/or search strategy, 3. justified publication restrictions (e.g. language) For Yes, should also have (all the following): 1. searched the reference lists / bibliographies of included studies, 2. searched trial/study registries, 3. included/consulted content experts in the	"justified publication restrictions" moved to "Yes"	To allow some flexibility. Otherwise a whole review can be marked as "no" for not justifying why only studies in English were selected.

	field, where relevant, 4. searched for grey literature, 5. conducted search within 24 months of completion of the review	"searched trial/study registries" removed.	Trials are often not applicable to the intervention studied
5. Did the review authors perform study selection in duplicate? *Yes or No*	For Yes, either ONE of the following: 1. at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include, OR 2. two reviewers selected a sample of eligible studies and achieved good agreement (at least 80 percent), with the remainder selected by one reviewer.	No modification	
6. Did the review authors perform data extraction in duplicate? *Yes or No*	For Yes, either ONE of the following: 1. at least two reviewers achieved consensus on which data to extract from included studies, OR 2. two reviewers extracted data from a sample of eligible studies and achieved good agreement (at least 80 percent), with the remainder extracted by one reviewer	No modification	
7. Did the review authors provide a list of excluded studies and justify the exclusions? *Yes, partial Yes, or No*	For Partial Yes: provided a list of all potentially relevant studies that were read in full-text form but excluded from the review For Yes, must also have: Justified the exclusion from the review of each potentially relevant study	No modification	
8. Did the review authors describe the included studies in adequate detail? *Yes, partial Yes, or No*	For Partial Yes (ALL the following): 1. described populations, 2. described interventions, 3. described comparators, 4. described outcomes, and 5. described research designs For Yes, should also have ALL the following: 1. described population in detail, 2. described intervention in detail (including doses where relevant), 3. described comparator in detail (including doses where relevant), 4. described study's setting, and 5. timeframe for follow-up	For Partial Yes (ALL the following): 1. described populations *(if relevant),* 2. described interventions, 3. described comparators *(if relevant),* 4. described outcomes, 5. described research designs For Yes (ALL the following): 1. described population in detail (if relevant), 2. described intervention in detail, 3. described comparator in detail (if relevant), 4. Described outcomes in detail,	Similarly to question 1, due to the nature of topics, there may be not comparator, little detail about the population and/or no follow-up.

		5. described research designs, 6. described study's setting, 7. timeframe for follow-up (if relevant)	
9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? *Yes, partial Yes, No, includes only RCTs, includes only NRSIs/observational/natural experiments*	**For RCTS** For Partial Yes, must have assessed RoB from: 1. unconcealed allocation, AND 2. lack of blinding of patients and assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality) For Yes, must also have assessed RoB from: 1. allocation sequence that was not truly random, AND 2. selection of the reported result from among multiple measurements or analyses of a specified outcome **For NRSI** For Partial Yes, must have assessed RoB: 1. from confounding, and 2. from selection bias For Yes, must also have assessed RoB: 1. methods used to ascertain exposures and outcomes, AND 2. selection of the reported result from among multiple measurements or analyses of a specified outcome	Apply the NRSI criteria to observational studies and natural experiments. These study designs were also added in the answer choices.	Observational studies and natural experiments also included in the overview as quantitative evidence
10. Did the review authors report on the sources of funding for the studies included in the review? *Yes or No*	For Yes: Must have reported on the sources of funding for individual studies included in the review. Note: Reporting that the reviewers looked for this information but it was not reported by study authors also qualifies	No modification	
11. If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	**For RCTs** For Yes: 1. The authors justified combining the data in a meta-analysis, AND 2. they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present, AND 3. investigated the causes of any heterogeneity	No modification	

Yes, No, or no meta-analysis conducted	**For NRSI** For Yes: 1. The authors justified combining the data in a meta-analysis, 2. AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present, AND 3. they statistically combined effect estimates from NRSI that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available, 4. AND they reported separate summary estimates for RCTs and NRSI separately when both were included in the review		
12. If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis? *Yes, No, or no meta-analysis conducted*	<u>For yes:</u> 1. included only low risk of bias RCTs, OR 2. if the pooled estimate was based on RCTs and/or NRSI at variable RoB, the authors performed analyses to investigate possible impact of RoB on summary estimates of effect.	No modification	
13. Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review? *Yes or No*	<u>For Yes:</u> 1. included only low risk of bias RCTs, OR 2. if RCTs with moderate or high RoB, or NRSI were included the review provided a discussion of the likely impact of RoB on the results	*<u>For Yes:</u> the review provided a discussion of the likely impact of RoB on the results [not possible if ROB is not discussed in context of included studies]* <u>Partial yes:</u> *the review provided a discussion of the likely impact of bias e.g. in terms of study designs used*	A partial yes was added "to assess when the review author provided discussion of the likely impact of possible bias (e.g., in terms of study design used) in the discussion section. A 'yes' response was reserved for studies that conducted a formal risk of bias and discussed the review's findings in relation to these." (Dickson et al, 2019)
14. Did the review authors provide a satisfactory explanation	<u>For Yes:</u> 1. There was no significant heterogeneity in the results, OR 2. if heterogeneity was present the authors performed an	No modification	

for, and discussion of, any heterogeneity observed in the results of the review? *Yes or No*	investigation of sources of any heterogeneity in the results and discussed the impact of this on the results of the review		
15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review? *Yes, No, or no meta-analysis conducted*	For Yes: performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias	No modification	
16. Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review? *Yes or No*	For Yes: 1. The authors reported no competing interests, OR 2. The authors described their funding sources and how they managed potential conflicts of interest	No modification	

Appendix 4: JBI Appraisal checklist for SRs and research syntheses

Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Systematic Reviews and Research Syntheses

Author_____Year_____ Record Number_____

		Yes	No	Unclear	Not applicable
1.	Is the review question clearly and explicitly stated?	☐	☐	☐	☐
2.	Were the inclusion criteria appropriate for the review question?	☐	☐	☐	☐
3.	Was the search strategy appropriate?	☐	☐	☐	☐
4.	Were the sources and resources used to search for studies adequate?	☐	☐	☐	☐
5.	Were the criteria for appraising studies appropriate?	☐	☐	☐	☐
6.	Was critical appraisal conducted by two or more reviewers independently?	☐	☐	☐	☐
7.	Were there methods to minimize errors in data extraction?	☐	☐	☐	☐
8.	Were the methods used to combine studies appropriate?	☐	☐	☐	☐
9.	Was the likelihood of publication bias assessed?	☐	☐	☐	☐
10.	Were recommendations for policy and/or practice supported by the reported data?	☐	☐	☐	☐
11.	Were the specific directives for new research appropriate?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

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- + chapter overview of reviews Cochrane Handbook
- + Nourishing framework