EVIDENCE REVIEW

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

A rapid review of evidence

Discretionary food and drinks (Phase Two): Definition of 'unhealthy' choices and review of food classification systems

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A rapid review of evidence: Discretionary food and drinks (Phase Two): Definition of 'unhealthy' choices and review of food classification systems

A rapid review of evidence prepared for the National Health and Medical Research Council

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Executive summary

Aim

The overarching goal of this systematic literature review is to improve consumer, clinician, educator, public health, industry and other sectors' understanding and use of definitions of 'discretionary' and/or 'unhealthy' food and drinks, synonyms and food classification systems. This project aims to identify and examine current practice around classification of 'unhealthy' food and drinks, determine the implications and limitations of providing a definition/s for 'discretionary food and drinks' via nutrient/food component level cut-points, prescriptive definitions, or both, while reflecting the operationally intended purpose of the Australian Dietary Guidelines, and recommend terminology, definitions and food classification systems for further examination.

Background

This is the report of Phase Two of the project. Phase One, finalised in November 2018, was a rapid review of the evidence on the articulation and classification of 'discretionary' food and drinks and/or related terms in different settings and by different sectors in Australia (Lee et al., 2018a). 'Discretionary' food and drinks are defined in the Australian Dietary Guidelines (ADGs) as those that "are not a necessary part of a healthy diet and are high in saturated fat, added sugars, salt and/or alcohol" [1]. Those food and drinks which are not classified as 'healthy' five food group foods or healthy fats and oils in the ADGs are 'unhealthy' discretionary choices.

In response to concerns about the perceived lack of a clear definition of 'discretionary food and drinks', and lack of alignment between dietary guideline recommendations and policy/programs, the Commonwealth Department of Health requested that the National Health and Medical Research Council (NHMRC) commission a rapid review of evidence to develop fit-for-purpose definition/s of 'unhealthy' food and drinks, in the context of different food classification systems, for application in various settings and policy environments in Australia.

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Methods

Fulfilling the aims of the project required identification of the definition and application of specific terms and concepts of 'unhealthy' and 'healthy' food and drinks in different countries, in different settings and policy environments and by different sectors. It also required identification of the strengths and limitations of the different approaches taken to define 'unhealthy' and 'healthy' food and drinks in these contexts.

Hence, Phase Two was conducted in three parts:

- **Part A** consisted of a systematic review of international evidence (peer reviewed reviews and international and national websites) of 'unhealthy' food and drinks and synonyms. Countries of interest included those with similar politico-economic systems to Australia (such as OECD member countries) and those showing international leadership in public health nutrition as identified on the website of the World Cancer Research Fund NOURISHING framework database (such as Brazil and Chile); publications were searched from the past 10 years.

  Two key research questions guided the systematic review:

  1. How are countries, comparable to Australia, differentiating 'healthy' and 'unhealthy' (discretionary) food and drinks for application in nutrition policy actions? and

2. In these countries where there has been evaluation of the nutrition policy actions, what are the reported health outcomes, strengths and limitations of the approaches taken to differentiate 'healthy' and 'unhealthy' food and drinks?

- **Part B** consisted of data synthesis and analysis to interpret relevant evidence around terms and definitions generated by Part A to investigate alternative terms that may enhance consumer understanding of the concepts underpinning 'unhealthy' eating. The data were synthesised to inform development of a bespoke taxonomy of food classification systems to provide a framework for comparison of terms, synonyms, definitions and characteristics, between and within different food classification systems. Data for each term and definition were collated by: source of definition; country where applied; the sector using the term; any stated conflict of interest; the relevant policy action area of the NOURISHING framework; and results of any process, impact or outcome evaluation related to application of the term. Data from key peer reviewed reviews that assessed specifically the strengths and limitations of various food classification systems were summarised in greater detail. Secondary analysis of nutrient/food component level cut-points and system-level cut-points used in nutrient profiling systems were conducted where possible.
- **Part C** consisted of comparison and contrast of findings of Part B, together with those of Phase One, to propose fit-for-purpose definition/s of 'unhealthy' food and drinks, and food classification systems for further consideration for application in various settings and policy environments in Australia. This was achieved by comparison, and identification of degree of alignment, of the attributes of 'healthy' and 'unhealthy' food and drink classification systems identified from the results of the systematic literature review, with the desired attributes of food definition systems for application in nutrition policy action areas in the NOURISHING framework.

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Results

Systematic searches identified 81 eligible peer-reviewed reviews, 32 international website pages and 122 webpages from national-level websites. Data was extracted to Excel spreadsheets, capturing key terms, definitions and applications in nutrition policy action areas as described in the NOURISHING framework [2].

A very wide range of terms, definitions and food classification systems were identified. The broad categories of terms and definitions of the bespoke taxonomy included: descriptive synonyms (category code UA); 'discretionary' (category UB); ultra-processed/processed (category UC); nutrient profiling systems (category UD); food habit focussed (category UE); sugar and sugar-sweetened beverages (SSBs) (category UF); food-based dietary guidelines lacking specific terms for 'unhealthy' food and drinks (category UG1); and none (category UH).

Nine included reviews assessed specifically the strengths and limitations of various food classification systems, but none assessed differences between systems. Secondary analysis of nutrient/food component level cut-points and system-level cut-points was conducted for one comprehensive review that identified 387 potential nutrient profiling systems, of which 78 different models are used by different governments globally [3].

The included reviews acknowledged lack of clarity and consensus around the terms and definitions for 'unhealthy' food and drinks in the literature. Common terms and approaches in peer reviewed reviews and international websites included: "energy-dense, nutrient-poor"; qualitative description of "unhealthy" food and drinks with high levels of "negative" nutrients and/or low levels of "positive" nutrients; lists of foods (apparently arbitrary); and "packaged" foods; "ready to eat" meals; and "snacks". Others included: "ultra-processed food", "junk food" and "non-core foods." A high proportion of reviews focused on definitions of

‘unhealthy’ (sugary) drinks specifically. The report of Phase One of this projects identified that the term ‘discretionary’ food and drinks was the most common used in Australian peer-reviewed literature [4].

National websites tended to reflect government initiatives, and focused on four particular nutrition policy applications: food-labelling, reformulation, healthy food procurement strategies (especially in schools) and, to a lesser extent, on communication and education initiatives. Two main categories of nutrient profiling systems were applied dominantly in the first two applications.

The first type of nutrient profiling systems were models that applied nutrient cut-offs across a spectrum to identify relatively ‘less unhealthy’ choices rather than absolute ‘unhealthy’ choices. Relative nutrient profiling systems are applied only within food categories, rather than across food categories; undefined terms for ‘less unhealthy’ choices in such systems include “low star” and “more red” choices.

The second type of nutrient profiling systems added system-level cut points to differentiate ‘unhealthy’ and/or ‘healthy’ choices specifically. Defined terms including “red”, “red whoa”, “occasional” and “sometimes” were used to denote ‘unhealthy’ food and drinks in these models. A promising recent development is the use of warning labels in Brazil and Chile to denote ‘unhealthy’ choices on food labels.

Definitions of terms were missing from many national and international websites.

Terms and definitions of ‘healthy’ food and drinks also were classified using the bespoke taxonomy. These represented the inverse of ‘unhealthy’ food and drinks in most food classification systems. A quarter of the peer reviewed reviews used the terms or concepts of ‘core’ foods or ‘five food group’ foods associated with food-based dietary guidelines to define ‘healthy’ food and drinks; another quarter used nutrient profiling systems to define the relative term ‘healthier’ choices (rather than the absolute term ‘healthy’ choices) such as “high star” or “greener” choices. Large variations in terminology for ‘healthy’ food and drinks, such as ‘green’, ‘everyday’ or ‘keyhole’, and related definitions were apparent. Several reviews used terms that are not necessarily related to the healthiness of specific foods, such as “natural” and “fresh”.

References to food-based dietary guidelines and specific food lists were most common on international websites. Both dietary guidelines and nutrient profiling systems featured on national websites, with some notable country differences, such as the NOVA system in Brazil and the application of warning signs in Chile.

No reviews or websites referred to ‘alternative’ or ‘fad diet’ terms used frequently to recommend population-level diets in popular Australian social media influencers’ blogs, such as “gluten free”, “dairy free”, “Paleo”, “low carb” and “high fat”, as identified in Phase One of this study [4].

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Understanding and use of different terms by different sectors

Phase One of this project, and the results of the literature review of Phase Two reported here, showed very high levels of misquoting, misuse and misinterpretation of terms describing ‘healthy’ and ‘unhealthy’ food and drinks. The latter was particularly the case for ‘discretionary’ food and drinks in Australia, with less than 40% of proffered definitions aligning with the ADGs in Part One [4]. Disparities varied according to several factors.

In Australia, the term ‘discretionary’ food and drinks, concept and underlying evidence base appeared relatively well understood and applied by dietitians/nutritionists, non-government organisations, and preventive health sections of government agencies, but less so by other public health professionals, those from a science/social science background, non-health professionals, the food regulatory sector, and/or those with conflicting and commercial interests. The education and consumer sectors did not use the term ‘discretionary food and drinks’ frequently. The term was used infrequently by sections of the food industry sector except in peer-reviewed publications, where more representatives of the sector (60%) used the term in alignment with the ADGs than any other sector. On websites and in submissions, food industry groups favoured the term “treat food” rather than ‘discretionary’ food and referred to nutrient profiling systems rather

than the ADGs. Such selective use of terminology for different audiences implies intentional, rather than accidental, application [4].

The evidence presented in this report of Phase Two confirmed preference for different food classification systems by different sectors for different applications. In particular, authors with manufacturing food industry connections were critical of the NOVA framework. Analysis of information on websites showed that health protection and food regulation agencies used nutrient profiling systems dominantly, with the broader public health and education sectors preferring application of food-based dietary guidelines and specific food lists. Such preferences may be explained by the different scope of potential policy applications addressed by these different groups. Many authors expressed concern about the great diversity, lack of impact and outcome evaluation (rather than process evaluation) and lack of predictive validity (rather than construct/congruent validity) of nutrient profiling systems globally; the arbitrary nature of quantitative criteria and cut-points applied in nutrient profiling systems is of particular concern for many nutritional epidemiologists. However, it is unsurprising that some health groups tend to support and advocate for broader uptake of food classification systems that they have developed or use most in their research.

The evidence presented supports the position of the World Health Organization (WHO), that there is a need to ensure transparency, rigour and public scrutiny of government food and nutrition policy, regulatory and norm-setting activities to ensure they are adequately protected from undue commercial interest [5-7].

Comparison and contrast of results

The highest scoring 'unhealthy' food definition/s and classification systems assessed by alignment with the desired attributes for each policy application of the NOURISHING framework were deemed to be the most promising fit-for-purpose approach in each setting and environment.

The type of key nutrition policy applications in the NOURISHING framework fall into three main groups:

- Type i: where the policy intent requires relative identification of 'healthier' and 'less healthy' food and drinks within food categories;
- Type ii: where the policy intent requires absolute identification of 'healthy' and 'unhealthy' food and drinks both within and across food categories; and
- Type iii: which focuses on the channel, mode and how an intervention is conducted, or on reduced portion size generally, rather than the type of food.[1]

Importantly, the attributes of no single food classification system met the requirements of every policy application. However there was a clear pattern of alignment of particular definitions of 'unhealthy' food and drinks and food classification systems with types of policy actions. Across all applications, the four most promising definitions of 'unhealthy' food and food classification systems, and the type of policy action they are most suited to, in no particular order are:

- the relative definition of 'less healthy' food and drinks using various nutrient profiling systems (UD3 and UD4) (Type i)[2] where specific system-level nutrient cut-points are provided (UD2) across food categories as well as within food categories (Type ii);
- "discretionary" definition of 'unhealthy' food and drinks as defined by the Australian Dietary Guidelines or similar (UB4) (Type i and Type ii);

[1] Definitions of 'unhealthy' food and drinks and systems of food classification are not relevant to the third type of nutrition policy application, so Type iii was not considered further.
[2] Alone, nutrient profiling systems ranking foods along a continuum within different food categories do not support differentiation of the absolute concept of 'unhealthy' or 'healthy' food and drinks.

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- the “ultra-processed” definition of ‘unhealthy food and drinks’ as defined by the NOVA classification system (UC1) (Type ii), and
- the application of multiple definitions of ‘unhealthy’ food and drinks, most commonly a mix of food-based dietary guidelines and a nutrient-profiling system (UA3) (Type i and Type ii).

Discussion

Strengths and limitations of the study

To our knowledge this is the first systematic review of peer-reviewed reviews and key websites of different definitions of ‘unhealthy’ food and drinks and food classification systems and their potential application to nutrition policy and practice internationally.

While nine peer-reviewed reviews were identified that specifically considered the strengths and weaknesses of different food classification systems, six of these focused specifically on nutrient-profiling systems, and only one of these was a systematic review [3]. Of the commentary (narrative) reviews identified, one focused on the NOVA system and ultra-processed foods and one focused on stakeholder perceptions of application of nutrition quality metrics. The one scoping review identified focussed on dietary sugars specifically. No identified reviews considered multiple definitions of ‘unhealthy’ food and drinks and/or different food classification systems, let alone comparing and contrasting findings to inform recommendations for further investigation, confirming the novelty of this current review.

Peer reviewed reviews were searched rather than original papers based on the results of the pilot study. Therefore one potential limitation in the study design arose due to the inherent delay associated with publication of reviews of peer-reviewed reviews; this could have precluded any relevant evidence from recent single studies being included in results. The risk of potential bias was highest for exclusion of any recent single studies on any emerging classification system and/or for exclusion of any recent evaluations of any food classification systems. It was postulated that the major food classification system affected by this limitation would be the more recently emerging NOVA classification using the “ultra-processed foods” definition. However, details of some recent ‘lower order’ developments, such as the French Nutri-Score food labelling system, may also have been missed inadvertently.

To help address the potential limitations in the study, additional publications of interest to the funders were provided for consideration to add context in the Discussion section. This material was also hand-searched to identify additional publications from authoritative international bodies, such as the United Nations and the World Health Organization, which might assist further in interpretation of the findings of the systematic review. Much of the additional material identified related to the term “ultra-processed” foods and drinks used in the NOVA food classification system.

Another limitation is that the systematic review did not identify any reviews or websites that included the concept of ‘environmental sustainability’ or ‘equity’ specifically within the definition of ‘healthy’ food and drinks. All included reviews focused on human health and wellbeing. It may have been implied that ‘unhealthy’ food and drinks were unsustainable, but this was not explicit in any included review or website. Consideration of ‘environmental sustainability’ and ‘equity’ in the definition of ‘healthy’ food and drinks would be desirable given the three principles of the Australian Food and Nutrition Policy 1992 are: health and wellbeing; equity; and ecological sustainability [8, 9].

Terms and definitions currently applied in nutrition policy and practice

A wide range of food classification systems and terms and definitions of ‘unhealthy’ and ‘healthy’ (and ‘less healthy’ and ‘healthier’) food and drinks were identified during the literature search. A major point of difference was between the systems designed to identify absolute ‘healthy’ and ‘unhealthy’ food and drinks

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(such as food-based dietary guidelines and systems based on degree of food processing), and those designed predominantly to differentiate ‘healthier’ and ‘less healthy’ choices (nutrient profiling systems).

Up until the 1990s, it was commonly claimed by representatives of the food industry that there was “no such thing as ‘healthy’ or ‘unhealthy foods’, only ‘healthy’ or ‘unhealthy’ diets” [10, 11]. However, the potential for certain foods to carry nutrient and health claims on their labels, and hence be promoted as ‘healthy’ options, appears to have contributed to changes in this view in several countries and regions dating from the early 2000s [11].

Compared to ‘healthy’ food and drinks, the concept of ‘unhealthy’ food and drinks remains less well embraced by some sectors, particularly those with vested commercial interest in marketing these products [4]. Relative terms for ‘healthier’ food and drinks defined by nutrient profiling systems tend to be more accepted by some sections of the food industry, than absolute terms for ‘unhealthy’ food and drinks [3].

However, some nutrient profiling systems do make it easier for consumers to avoid ‘unhealthy’ food and drinks by inclusion of system-level nutrient cut-points in some applications, to guide the use of terms such as “red foods” (England, South Korea), “red category” foods (NZ, Australia, UK), “red-whoa” foods (US CDC) or “dark orange” foods (Belgium, France, Switzerland) in colour-coded nutrient profiling systems. Warning labels have been used more recently in Brazil and Chile, and found to be more effective than traffic light labelling in a randomised controlled experiment in Brazil [12]. Such approaches are usually applied in food, shelf or menu board labelling, and have been used also in food supply initiatives in public sector settings such as school and hospitals.

The corresponding relative terms for ‘healthier’ and/or, if system-level nutrient cut-points are applied, ‘healthy’ food and drinks identified by nutrient profiling systems include “green” foods (England, South Korea), “green category foods” (NZ, UK), “green go” (US CDC), “dark green” foods (Belgium, France, Switzerland) or “green choice” drinks (some US cities including Boston) in colour-coded systems, or “preferable” foods (Netherlands) or “keyhole” foods (Denmark, Norway, Sweden, Iceland). School canteen systems in some Australian jurisdictions use the terms “everyday foods” and “thumbs up” foods (in more remote areas). Such terms tend to be less well defined when used in relative nutrient profiling systems; an example is as “low score” or “low star” foods in summary single score systems, such as the Health Star Rating system in Australia and New Zealand.

Identification of relatively less ‘unhealthy’ food and drinks introduces risk that consumption of these foods is inadvertently promoted over that of unlabelled foods that are actually ‘healthy’, such as fresh fruit and vegetables [11]. This is a potential risk inherent in the application of relative nutrient profiling systems in food labelling, including the HSR system in Australia and New Zealand.

Other food classification systems more directly identify ‘unhealthy’ and ‘healthy’ food and drinks based on the nature of the relationship between their consumption and health outcomes in quality studies. The absolute terms for ‘unhealthy’ food and drinks identified by these methods include “ultra-processed food” (Brazil), “energy-dense nutrient poor” (several countries and regions), “junk food” (Australia), “non-core foods” (Australia and New Zealand) and “occasional” foods (some school systems in Australia). The absolute terms for ‘healthy’ food and drinks identified included “five food group” (Australia), “four food group” (NZ, Canada), “core” (Australia – pre 2013, but often misused) and “basic, healthy” foods.

High levels of of misquoting, misuse and misinterpretation of terms describing ‘healthy’ and ‘unhealthy’ food and drinks were identified and varied according to publication type, sector and/or profession, any conflict of interest, and the type of policy and practice application in which the terms were used [4].

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Key learnings that may be applicable to the Australian context

The results of the literature review identified how other countries approach and refer to 'healthy' and 'unhealthy' food and drinks. Key learnings that may be applicable to the Australian context include the need to:

- identify the most suitable terms, definitions and food classification systems for different policy and practice applications;
- ensure that the different systems applied in policy and practice will deliver healthier diets, improve health and wellbeing, and reduce risk of diet-related disease at a population level (i.e. that the food classification systems are based on evidence and are evaluated at impact (effect on diet) and outcome (effect on health) level, not just at the level of process indicators, such as awareness, understanding, uptake, acceptability etc.);
- acknowledge that food classification systems designed to differentiate relatively 'less healthy' and 'healthier' food and drinks may not deliver 'healthy' diets or improve diet-related health at population level;
- consider protective aspects of whole foods, such as the food matrix or degree of processing, as well as the content of nutrients and/or other food components on health outcomes (and the converse) (i.e. avoid reductionist approaches to food classification systems);
- ensure complete transparency, and support potential replicability of testing, of all methods and approaches applied;
- ensure those with vested interests are not involved in policy development, but rather policy implementation, consistent with the recommendations of the World Health Organization [5-7];
- work collaboratively internationally to seek evidence-informed consensus on potentially arbitrary decision points applied in some food systems (including criteria around the number, nature and/or value of foods, drinks, nutrients, food components or other ingredients, nutrient-specific cut-points, or system cut-points);
- mandate, potentially via legislation, evaluated food classification systems, to ensure they function most effectively;
- whatever evidence-based definition of unhealthy food or food classification system is applied, it is imperative that the approach is actioned in multiple food policy and practice applications to address the barriers to, and opportunities for, healthy eating in the community; and
- promote and market terms, definitions and rationale of selected evaluated food classification system/s to ensure high levels of understanding, acceptance, uptake and accurate and consistent application among consumers and all sectors.

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Fit-for-purpose definition/s of 'discretionary' food and drinks and 'unhealthy' food and drinks and food classification systems for further consideration

(Re)investigating any alternative terms that may enhance consumer understanding of the concepts underpinning 'unhealthy eating' was a stated requirement of this project. However, as can be seen from the results, while the most promising term for 'discretionary' food and drinks and synonyms is 'unhealthy' food and drinks, it is neither sensible nor possible to recommend a fully defined term for 'unhealthy' food and drinks without reference to the food classification system to which it corresponds. Also, importantly, different terms inherent in different food classification systems are most suited to different applications.

If one term, definition and associated food classification system was suitable for application in all potential food and nutrition policy and practice actions, it would have been clearly indicated in the results.[3] However, no such single solution emerged.

This lack of a clear dominant term, definition and food classification system suitable for application in all potential food and nutrition policy and practice actions is consistent with the evidence presented in all included peer-reviewed reviews. It also helps explain why so few attempts appear to have been made globally to identify such a universal approach.

However, the main requirement of a definition of 'discretionary' food and drinks and 'unhealthy' food and drinks, by default, is that it must be based on the relationship between the consumption of the food or drink product and the risk of poor diet, diet-related risk factors, and diet-related health outcomes.

With respect to terminology, of the over 20 different terms and synonyms for 'unhealthy' food and drinks identified in this systematic review, most terms and synonyms in common use, including 'discretionary food and drinks', are proxies for the term 'unhealthy' food and drinks, suggesting it would be a better option to use this actual term to directly designate 'unhealthy' food and drinks.

Further, of the 13 different food classification systems identified in this project, across all policy and practice applications, 'unhealthy' food is potentially defined most promisingly in four key food classification systems identified in the results above.

The systematic literature review identified that these systems have many different strengths and weaknesses; these are highlighted in detail in the body of the report. Some examples include that a strength of the ADGs is that they are based on quality, graded evidence from systematic reviews of food, diet, health relationships; a limitation is low awareness by consumers, policy-makers and other end users. Conversely, a strength of the NOVA system is high awareness among consumers; a limitation is that the described mechanistic rationale is not accepted by all stakeholders. Strengths of nutrient profiling systems include high awareness among consumers, and that they inform product reformulation regarding reduction of salt and added sugar. Limitations of relative nutrient profiling systems is that they don't support definition of the absolute terms 'unhealthy' and 'healthy' food and drinks. Limitation of nutrient profiling systems that include system-level cut-points to help define terms, is that they have not been evaluated at impact or outcome level. They need to be modified with the addition of validated system-level cut-points to enable differentiation of 'unhealthy' rather than 'less unhealthy" food and drinks.

The lack of a widely-accepted gold standard food classification system identified by predictive validity testing, has led to a multitude of studies of construct/convergent validity of one food classification system against another food classification system. The results of such construct/congruent validity testing cannot be used to identify whether one food classification system is superior to another, merely to help identify where they may differ. However, this literature review suggests that, in a number of cases, construct/congruent validity testing is being used inappropriately to advocate for one system over another, implying that one food classification system is superior to all others. However, as identified previously [13], this review has confirmed that different terms inherent in different food classification systems are most suited to different nutrition policy and practice applications.

The value of any system that identifies relatively 'less unhealthy' food and drinks and inadvertently promotes consumption of these, rather than identifying 'unhealthy' food and drinks to avoid and 'healthy' food and drinks to promote and consume, should be questioned. This is an inherent risk with nutrient profiling

[3] Particularly the colour-coded scored results table (Table 15).

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systems. To help minimise such risks, one promising recent policy action identified in this review is the use of “warning labels” on ‘unhealthy’ food and drinks.

Conclusions and recommendations

To improve the health of Australians it is imperative that the population is supported to consume healthy diets; this means consuming more ‘healthy’ food and drinks and consuming less ‘discretionary’ or ‘unhealthy’ food and drinks [1, 14-16]. To achieve this will require improved food environments to help people make healthy choices, and consistent messaging to increase understanding of agreed, evidence-based definitions of ‘unhealthy’ and ‘healthy’ food and drinks.

The evidence presented in Phase One and Phase Two of this project has considered the current definition/s of ‘discretionary’ and other synonyms for ‘unhealthy’ food and drinks and application and alignment across current nutrition policy, programs and guidance, by different sectors, both nationally and internationally.

The conclusions regarding the most promising fit-for-purpose terms, definitions and food classification systems based on the evidence presented in the systematic reviews (Phase One and Phase Two) are presented in Box 1. This work was commissioned to explore and develop a fit-for-purpose definition for ‘discretionary foods and drinks’ as this is the terminology used in the current Australian Dietary Guidelines [1]. The evidence presented in this systematic literature review supports replacement of the term ‘discretionary’ food and drinks with the term ‘unhealthy’ food and drinks.

Consideration of four promising food classification systems to provide context for the recommended term and definition of ‘unhealthy’ food and drinks is a non-trivial task, particularly as nutrition science is constantly evolving. The food system is complex, and unintended consequences can be highly problematic. Interrogating the strengths and limitations of the four approaches requires advanced nutrition epidemiology and technical knowledge, skills and abilities.

A key requirement for an enduring, fit-for-purpose definition of the term ‘discretionary food and drinks’ (and term ‘unhealthy’ food and drinks) and supporting food classification system is that the approach must be validated directly against dietary impacts, risk factors and diet-related health outcomes.

Consideration should also be focused on contemporary evidence that it is the whole food, rather than any specific nutrient or component that is the exposure determinant of diet-related health outcomes. In particular, there is a growing body of evidence that interactions in whole foods between nutrients, other food components, mechanisms of food processing and the food matrix itself need further consideration when determining whether a food is ‘unhealthy’ or ‘healthy’ and hence application of any nutrient/food component level cut-off points requires careful interrogation.

As the literature reviews that informed the ADGs are now 10 years old, and all ‘unhealthy’ and ‘healthy’ food and drinks are related intrinsically in their contribution to dietary patterns (the dominant exposure variable in diet-related health), it is imperative that this work is conducted within the context of broader review of the ADGs.

Further, the evidence from these systematic reviews (Phase One and Phase Two) illustrates clearly that best practice governance and consultation structures, such as those characteristic of NHMRC internal guideline processes, are required to progress such work efficiently and effectively.

Poor diet as a whole is now the leading risk factor contributing to burden of disease globally and in Australia [14] and so urgent action is required.

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Box 1. Conclusions regarding the most promising fit-for-purpose terms, definitions and food classification systems based on the evidence presented in the systematic reviews	
Terminology and definition of 'discretionary' food and drinks.	The most promising term for 'discretionary' food and drinks and synonyms is 'unhealthy' food and drinks. 'Discretionary' food and drinks are defined as 'unhealthy' food and drinks that are not essential components of a healthy diet[4] and for which the best available epidemiological evidence shows a relationship between the consumption of the food or drink and one or more of the following: • a poor diet, • risk factors for diet-related disease, and • adverse diet-related health outcomes.
Definition of 'unhealthy' food and drinks	Unhealthy food and drinks are not essential components of a healthy diet and are those for which the best available epidemiological evidence shows a relationship between the consumption of the food or drink and one or more of the following: • a poor diet, • risk factors for diet-related disease, and • adverse diet-related health outcomes. The definition of 'unhealthy' food and drinks is the inverse of 'healthy' food and drinks.
Definition of 'healthy' food and drinks	Healthy food and drinks are defined as those for which the best available epidemiological evidence shows a relationship between the consumption of the food or drink and one or more of the following: • a healthy diet, • protective factors for diet-related disease, and • positive diet-related health outcomes and wellbeing. The definition of 'healthy' food and drinks is the inverse of 'unhealthy' food and drinks.
Promising food classification systems providing context for recommended terms and definitions	Across all policy and practice applications, 'unhealthy' food and drinks is potentially defined most promisingly in four key food classification systems: • nutrient profiling systems where both specific, validated nutrient/food component and system-level cut-points are provided across food categories as well as within food categories, and 'unhealthy' food and drinks are clearly distinguished (for example, by warning labels on foods); • food based dietary guidelines, such as the Australian Dietary Guidelines; • systems based on degree of food processing, such as the NOVA classification; and

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[4] A healthy diet is one that is consistent with the recommendations of the Australian Dietary Guidelines [1].

	• application of multiple definitions of ‘unhealthy’ food and drinks, most commonly a mix of food-based dietary guidelines and a modified nutrient-profiling system.

As requested, this novel project has systematically reviewed peer-reviewed and grey literature nationally and internationally to identify and examine current practice around classification of ‘unhealthy’ food and drinks, and to determine the implications and limitations across various settings and policy environments of providing a definition/s for ‘discretionary food and drinks’ via nutrient/food component level cut-points, prescriptive definitions, or both, while reflecting the operationally intended purpose of the Australian Dietary Guidelines.

Using a systematic approach and novel synthesis and analysis methods, the project has proposed to define ‘discretionary food and drinks’ using the term ‘unhealthy’ food and drinks, formulated a definition and identified promising food classification systems and a potential way forward for further consideration by NHMRC and its Expert Working Group.

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1 Introduction

The National Health and Medical Research Council (NHMRC) appointed a collaborative team developed by The University of Queensland to conduct a rapid review which considers and develops a definition/s for 'discretionary food and drinks'. Discretionary foods[5] are defined in the Australian Dietary Guidelines (ADGs) (2013) as foods and drinks that "are not a necessary part of a healthy diet and are high in saturated fat, added sugars, salt and/or alcohol" [1].

This project was initiated by a joint Food Regulation Standing Committee/Australian Health Ministers' Advisory Council working group. The Australian Government Department of Health requested the NHMRC to undertake a gap identification about discretionary food and drinks. This work aims to investigate the evidence on the way in which unhealthy (discretionary) food and drinks are classified and articulated in the key government and non-government nutrition resources, with the aim of improving consumer, clinician, educator and industry understanding of the terms. The final product/s may form part of any review of the 2013 ADGs.

2 Background: The problem of interest

This is the second phase of the NHMRC project on 'discretionary food and drinks'. The first phase, finalised in November 2018, was a rapid review of the evidence on the articulation and classification of discretionary food and drinks in different settings [4]. The rapid review determined broader consumer, health professional, industry and educator understanding of the term 'discretionary food and drinks' in Australia, and how the articulation of the discretionary food and drinks aligned with the ADGs.

The evidence presented in that initial review indicated that – while the concept, definition and intent of 'discretionary food and drinks' in the ADGs accurately reflect contemporary nutrition science approaches – there is a wide scope in definitions and interpretations of the term in the literature and across varying settings. The NHMRC has identified that currently there are low rates of understanding of the definition, intent and application of the term 'discretionary food and drinks' as outlined in the ADGs. While the concept, definition and intent of 'discretionary food and drinks' in the ADGs accurately reflect contemporary nutrition science approaches, greater clarity and consistency around the term 'discretionary food and drinks' could help reduce the high degree of misunderstanding, misinterpretation and misuse of the term, synonyms and relevant concepts.

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The initial rapid review postulated that it is possible to develop and apply a working 'fit for purpose' definition/s of 'discretionary food and drinks' in nutrition policy and practice initiatives to improve diet-related health in Australia. The NHMRC subsequently commissioned a second rapid review to consider in further detail a 'fit for purpose' definition (or definitions) that provides enhanced structure, understanding and guidance in the articulation of the term 'discretionary food and drinks'.

The background documentation of the initial work request identified that "dietary patterns characterised by excess dietary saturated fat, sodium, added sugars and alcohol are associated with increased health risk". The request raised two key points:

1. Definition: The Australian Dietary Guidelines (ADGs) have been criticised for not clearly defining what discretionary food and drinks are in relation to Guideline 3 ('Limit intake of foods containing saturated fat, added salt, added sugars and alcohol'). In contrast, the Five Food Groups (previously defined as core

[5] A simple synonym of 'discretionary food' is 'unhealthy foods'.

foods before the 2013 ADGs) identify nutritious foods with actual food names and quantified amounts rather than identifying detrimental nutrients. This has reportedly resulted in an area of confusion for policy makers, health professionals, food industry and consumers, contributing to reported lack of compliance with the ADGs.

2. Lack of alignment from recommendations to policy/programs: Nutrition interventions should aim to operate synergistically with dietary guidelines which provide an evidence-based framework. Health professionals, food industry, policy makers and consumers have observed a lack of alignment with core principles of the ADGs in the design, implementation and evaluation of current nutrition policies, campaigns and interventions (for example Health Star Rating, Healthy School Canteen Policies, nutrition/health claims, and fortification initiatives). This lack of alignment threatens the credibility and sustainability of dietary guidelines.

3 Aim

The project aims to determine the implications and limitations of providing a definition/s for 'discretionary food and drinks' via nutrient/food component level cut-points, prescriptive definitions, or both, while reflecting the operationally intended purpose of the Australian Dietary Guidelines (ADGs).

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4 Methods and research protocol

4.1. Broad approach

To meet the overall aim of the project, it was necessary to consider the evidence presented in the initial Rapid Evidence Review (Phase One) [4] in the context of the evidence generated in this second review (Phase Two). The overall approach and integration between Phases One and Two are depicted in Figure 1.

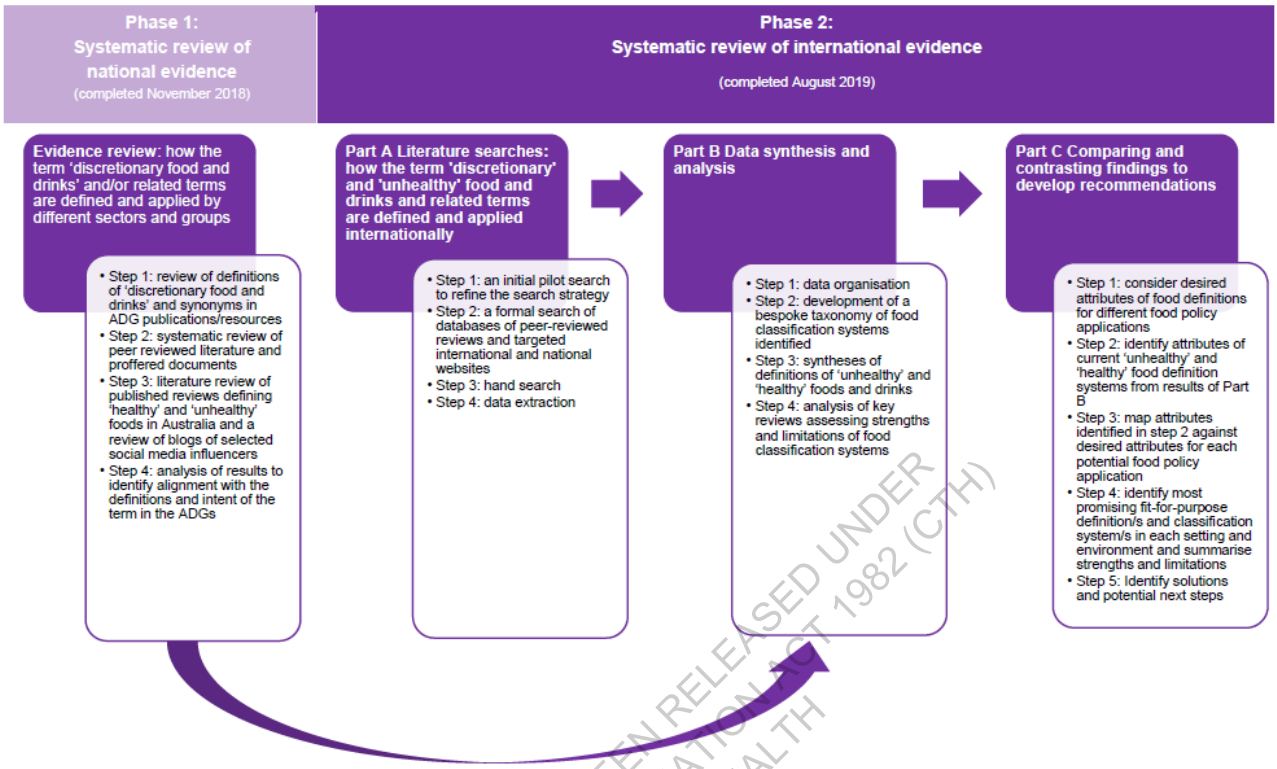
4.1.1. Consideration of the evidence presented in the initial rapid review (Phase One)

To meet the overall aim of the project, it was necessary to consider the evidence presented in the initial Rapid Evidence Review (Phase One) with respect to:

- the current definition/s of 'discretionary food and drinks' and alignment across current nutrition policy/programs/guidance
- the current food policy considerations relating to discretionary food and drinks both nationally and internationally including any criteria established for front-of-pack labelling schemes
- determining if any nutrient interactions observed in whole foods need further consideration when determining nutrient/food component level cut-off points, and
- considering the need, implications and limitations in providing nutrient-level cut-off points and a prescriptive definition of 'discretionary food and drinks' while ensuring the core principles of the ADGs are not undermined.

A summary of the results of Phase One are included in this report at 5.3.5.

Figure 1. Project phases, stages and steps



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4.1.2. Current review (Phase Two)

The approach to conduct this second review (Phase Two), to produce evidence to be considered with that presented in the initial review (Phase One), involved:

- reviewing research published from 2009, as this is the length of time since the systematic and literature reviews underpinning the ADGs were completed
- reviewing evidence included in the 'grey literature' such as key national and international authoritative reports, guidelines and relevant papers
- considering how other countries approach and refer to 'healthy' and 'unhealthy' food and drinks including any key learnings around implementation that may be applicable to the Australian context
- (re)investigating any alternative terms that may enhance consumer understanding of the concepts underpinning 'unhealthy eating' e.g. 'ultra-processed food', 'energy-dense nutrient poor', 'unhealthy food and drinks', 'junk food', and 'non-core foods'
- considering if nutrient/food component level cut-points should be investigated to determine the appropriateness of using these within a definition/s (with the understanding that any nutrient/food profiling must align with the concepts of the ADGs i.e. reductionist approaches should be avoided unless justified) and
- proposing an enduring definition/s for further consideration by NHMRC and its expert working committee, including consideration of implications across various settings and policy environments.

Phase Two of the project was conducted in three parts.

Part A consisted of an extensive literature search of peer reviewed reviews and grey literature (such as key international authoritative reports, guidelines and information from relevant websites) in a systematic manner that considered how 'healthy' and 'unhealthy' food and drinks are approached, considered and defined in other countries. Countries of interest included those with similar politico-economic systems to Australia (such as member countries of the Organisation for Economic Co-operation and Development (OECD), and those showing international leadership in public health nutrition (e.g. Brazil) as identified on the website of the World Cancer Research Fund NOURISHING Framework [2] dating from the past 10 years. This incorporated key learnings around implementation that could be applicable to the Australian context.

Part B consisted of transcribing and transparently interpreting relevant evidence around terms and definitions identified through Phase Two Part A (above) and the previous Rapid Evidence Review (Phase One) to (re)investigate alternative terms that may enhance consumer understanding of the concepts underpinning 'unhealthy eating' e.g. 'ultra-processed food', 'energy-dense nutrient poor food', 'unhealthy food and drinks', 'junk food', and 'non-core foods', including whether it is appropriate to apply nutrient/food component level cut-points within the definitions of these terms. This included identification of the benefits and challenges associated with each term in regard to consumer understanding of 'unhealthy' and 'healthy' eating in various settings and policy environments, with a particular focus on the application of nutrient/food component level cut-points within the definitions of these terms. Secondary analysis of relevant quantitative data related to nutrient profiling systems included in the reviews was also conducted.

Part C consisted of comparing and contrasting the findings of Phase Two Part B, to propose the most promising, fit-for-purpose definition/s of 'unhealthy' (and if deemed warranted by findings 'healthy') food for application in various settings and policy environments in Australia, for further consideration by NHMRC and its expert working committee. As requested, the proposed definition/s include consideration of implications across various settings and policy environments.

Fulfilling the aims of the project required identification of the definition and application of specific terms and concepts of 'unhealthy' and 'healthy' food and drinks in different countries, in different settings and policy environments and by different sectors. It also required identification of the strengths and limitations of the different approaches taken to define 'unhealthy' and 'healthy' food and drinks in these contexts. In effect, the search needed to identify evidence of opinion and approach to translation of the scientific evidence on food, diet and health relationships into policy and practice. As this is a novel requirement of systematic review processes, a pilot study was undertaken to test the search strategy proposed initially for feasibility and practicality in the timeframe provided for this rapid review.

The final detailed search strategy was informed by the results of the pilot and consultation with the NHMRC project team. This is summarised in section 4.2. The details of the final search strategy, the processes to develop this and the results of the pilot study are presented in Appendix 1.

4.2. Search strategy

The specific research questions interrogated and the methods used to answer these are summarised in Table 1.

The search strategy was structured to capture wide variations on definitions of 'unhealthy' food and drinks, not just 'discretionary' food and drinks. The primary research question was descriptive in nature and does not capture all investigations of causality or evaluations of detailed interventions; however, the evaluations captured in the primary search will be extracted and analysed to answer the secondary research question

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and inform part B of this project. As the search aims to identify evidence of definition and use of terms, and any reported opinions of the strengths and limitations of these terms, it is unnecessary (and undesirable) to assess the quality of the systematic reviews included. Therefore, the appropriate study design is more consistent with a comprehensive scoping review than a systematic review. The search strategy was informed by the Methodology for Joanna Briggs Institute Scoping Reviews Methodology (2015)[6] as applied in the Scoping Study for a new National Nutrition Policy in Australia [17].

The search strategy included a three-step process:

- Step 1: an initial pilot search to refine the search strategy
- Step 2: a formal search of databases of peer-reviewed literature, and targeted international and national websites
- Step 3: hand search of targeted national websites.

Table 1. Research questions and summary methods

Research questions	Methods
Primary question: How are countries, comparable to Australia, differentiating 'healthy' and 'unhealthy' (discretionary) food and drinks for application in nutrition policy actions?	Systematic literature review of peer reviewed international reviews of 'healthy' and 'unhealthy' food or synonyms. Extracted data including terms, definition, source of definitions, application, synonyms, countries, sectors, and conclusions from all included reviews. Searched international and national websites in a systematic manner for 'unhealthy' and 'healthy' food and synonyms and extracted data as above. Results were synthesised by terminology, definition, application and sector, and conclusions from all included reviews.
Secondary question: In these countries where there has been evaluation of the nutrition policy actions, what are the reported health outcomes, strengths and limitations of the approaches taken to differentiate 'healthy' and 'unhealthy' food and drinks?	As for the primary question above, extracting from included documents (reviews and/or websites) any results of evaluations and/or analysis of strengths and limitation of the approaches taken to differentiate 'healthy' and 'unhealthy' food and drinks or synonyms. Results were synthesised by terminology, definitions, application, sector, strengths and limitations

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[6] http://joannabriggs.org/assets/docs/sumari/Reviewers-Manual_Methodology-for-JBI-Scoping-Reviews_2015_v2.pdf

4.2.1. Search parameters and terms

4.2.1.1. Search population

Country level: (i.e. involving all sectors of the community including food industry, consumers, health professionals, educators, policy makers including food regulators, and researchers): any age; any gender.

- OECD countries with similar socio-economic political systems as Australia: Austria; Belgium; Canada; Chile; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Iceland; Ireland; Israël; Italy; Japan; Korea; Luxembourg; Mexico; Netherlands; New Zealand; Norway; Poland; Portugal; Slovak Republic; Slovenia; Spain; Sweden; Switzerland; Turkey; United Kingdom ; United States
- Other countries identified in the pilot search, including Brazil, Chile, Mexico, South Africa, French Polynesia, Argentina, Singapore and Ghana
- Multi-country regions with joint nutrition policies – Nordic countries and the European Union.

4.2.1.2. Intervention

The 'intervention' was a review or study with a primary aim to:

- provide a definition that distinguishes 'healthy' and 'unhealthy' food and/or drinks or their synonyms; and/or
- apply a definition that distinguishes healthy and unhealthy food and drinks as a tool, strategy, criterion or guidance to improve diet and/or health.

4.2.1.3. Comparator

No relevant definition applied.

4.2.1.3. Outcome

Outcomes were classified according to the differentiation of 'unhealthy' and 'healthy' food and drinks or synonyms (where evaluations available).

4.2.1.4. Time

Documents published since January 2009, as this is the length of time since the systematic and literature reviews underpinning the Australia Dietary Guidelines (2013) were completed.

4.2.1.5. Sources

1. Peer-reviewed reviews indexed in a range of databases (details below)
2. 'Grey literature' such as key international and national authoritative reports, guidelines and articles addressing nutrition policies, strategies and programs, published on:
    - International-level websites (listed at 4.2.1.9)
    - National-level websites (listed at 4.2.1.10)

4.2.1.6. Inclusion criteria

As for intervention above.

4.2.1.7. Exclusion criteria

- Any review with a primary aim to answer a clinical research question

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- Any review that addresses the relationship between single nutrients, foods, food groups or dietary patterns and health, wellness or specific medical conditions, including obesity
- Any review with a primary aim to examine a social, agricultural or environmental sustainability research question
- Any review that does not include at least one original paper from one of the in-scope countries
- Any article that is not a review
- Any article that reports on a review protocol only
- Any review that does not define or differentiate between 'healthy' and 'unhealthy' food and drinks or their synonyms in the text of the review

4.2.1.8. Databases

- The Cochrane Library (including Cochrane Public Health Group Specialised Register)
- PubMed
- MEDLINE (including 'in process citations')
- EMBASE
- CINAHL
- Scopus
- EPPI Centre (DoPHER and TRoPHI)
- ERIC
- Web of Science (Science Citation Index, Social Sciences Citation Index and Conference Proceedings Citation Index)

4.2.1.9. International-level websites

- EU Platform on Diet, Physical Activity and Health
  http://ec.europa.eu/health/ph_determinants/life_style/nutrition/platform/database/
- International Union for Health Promotion and Education
  http://www.iuhpe.org
- Health Technology and Assessment Programme
  http://www.ncchta.org
- NICE guidelines
  http://www.nice.org.uk
- SIGN guidelines
  http://www.sign.ac.uk
- US Centres for Disease Control and Prevention
  http://www.cdc.gov/
- World Health Organization
  http://www.who.int/en/
- Food and Agricultural Organisation
  http://www.fao.org/home/en/

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- World Public Health Nutrition Association
  https://www.wphna.org/
- INFORMAS (International Network for Food and Obesity / Non-communicable Diseases (NCDs) Research, Monitoring and Action Support)
  http://www.informas.org/
- World Cancer Research Fund International (WCRF)
  https://www.wcrf.org/

4.2.1.10. National-level websites

National health-centred ministerial websites of in-scope countries, including:

- other OECD countries with similar socio-economic political systems as Australia7, including: Austria; Belgium; Canada; Chile; China; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Iceland; Ireland; Israël; Italy; Japan; Korea; Luxembourg; Mexico; Netherlands; New Zealand; Norway; Poland; Portugal; Slovenia; Spain; Sweden; Switzerland; Turkey; United Kingdom; and, United States of America
- other countries identified as implementing innovative nutrition policy actions, including: Brazil; Mexico; South Africa; French Polynesia; Chile; Argentina; Singapore; and, Ghana.

4.2.1.11. Search terms for peer reviewed literature search

Each database was searched with a combination of:

- term searches (in title and abstract fields) and
- index categories (e.g. MeSH, subject, mTree terms (depending on database language)).

This approach increased the likelihood that the search captured relevant publications either through exact match of commonly used terms or through indexing to overarching topics.

Detailed search terms and index categories are included at Appendix 1 Table A1Ai.

4.2.1.12. Search process for websites

All websites that were not published in English (and did not have a built-in translation option) were translated using the Google 'translate' function. The following search terms were systematically entered into each website-specific search engine:

- Healthy food OR Unhealthy food OR Discretionary food OR Occasional food OR Sometimes food OR 'Ultra-processed food' OR NOVA OR Prepared food OR 'Highly processed food' OR Processed food OR 'Food prepared outside the home' OR Extra food OR Junk food OR 'Energy dense nutrient poor food' OR Empty calorie food OR Non-core food OR Sugar sweetened beverage OR Beverage guidance system OR Core food OR Five food group OR 'Classification of foods and drinks' OR nutritional criteria OR nutrition criteria OR nutrient profile OR nutrient profiling OR nutrient score OR nutrient score OR Sugary drinks OR keyhole

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[7] Those countries and regions identified as having a national nutrition policy in the Scoping Study for a new National Nutrition Policy in Australia [8] were prioritised.

The first five pages of returns (when sorted by relevance) from each search term was scrutinised. If returns were not formatted as pages, then the first ten items were scrutinised. If the list of returns included a URL link to a different webpage or a different ministry/ agency, this was not followed. Only returns that were pages within the website being searched were scrutinised. More details of the search process for websites are included in Appendix 1.

4.2.1.13. Conduct of literature search

To minimise potential bias, the literature search of peer reviewed reviews and grey literature (websites), including hand searching, was conducted by an investigator with expertise in public health and the conduct of systematic reviews (BF), but with little formal training in nutrition specifically, and no previous involvement in the science of defining healthy and unhealthy food and drinks or in the application of such definitions in nutrition policy actions.

4.3. Data extraction (Part A)

Data extraction was conducted by one investigator (BF) using a standardised database (to limit inter-observer variance). Data extraction from nine (11%) of the included reviews was checked by a second investigator (MH) with postgraduate training in public health nutrition.[8] The data extraction fields were developed through an iterative process involving two investigators, and feedback from NHMRC during the pilot stage.

The specific data extraction terms used to capture evidence from each search are detailed in Appendix 1 Table A1Aii.

The application of terms and definitions (specific area of nutrition policy action) was classified according to an expanded version of the NOURISHING framework. Details, including the framework applied, are provided in Appendix 1 Table A1Aiii.

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4.4. Data synthesis and analysis (Part B)

The detailed data extraction table generated by the systematic review of the peer reviewed and grey literature (Part A) was scrutinised for types of terms and definitions of 'unhealthy' and 'healthy' food and/or drinks and synonyms to develop a taxonomy of classification. The data extraction tables were reordered according to this initial classification to facilitate comparison between and within groups of terms and synonyms. Three investigators then worked together, coding each entry by consensus. The data extraction tables were reordered accordingly, and information for each term and definition was synthesised.

The synthesised data was summarised separately for 'unhealthy' and 'healthy' food and drinks and synonyms and literature source (either peer reviewed reviews or websites) in Word tables under the following headings: term, qualitative and quantitative definitions, application, source of definition, country, sector and any conflict of interest, type of review, any evaluation, strengths and/or limitations, and comments[9].

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[8] There was a high degree of concordance between the two observers (96%) with the second observer agreeing with all extracted data, but suggesting the extraction of additional qualifying text in 27 fields. This was added to the data extraction table as identified in shading in Appendix 2A in the fields: terms, definition, evaluation and key conclusions, across four reviews. The inclusion of the additional text did not affect the results of synthesis or analysis or the findings of the review.

[9] As terms used in peer reviewed reviews to describe 'unhealthy' and 'healthy' food and drinks and synonyms tended to be the inverse of each other, the summary data extraction field of 'any evaluation, strengths and/or limitations' was not repeated in the summary tables of definitions of 'healthy' food and drinks to improve readability.

Additionally, key reviews assessing specifically the strengths and limitations of various food classification systems (such as the relative recent classification systems based on degree of food processing such as the NOVA classification) were identified and summarised in greater detail. Given the particular focus within the aim of the project on the application of nutrient/food component level cut-points within definitions of terms, detailed quantitative and qualitative data were synthesised from those reviews dealing specifically with different nutrient profiling systems.

4.5. Identification of the most promising fit-for-purpose definition/s of 'unhealthy' food (and synonyms) and food classification systems for different applications (Part C)

The findings of Phase Two Part B and Phase One of the project were compared and contrasted to propose the most promising fit-for-purpose definition/s of 'unhealthy' (and if deemed warranted by findings, 'healthy') food and food classification systems. Fit-for-purpose definitions were deemed to be those most suited for application in different settings and policy environments.[10] The range of potential policy and practice applications was identified using the NOURISHING framework [2], as this approach is widely accepted internationally. The framework was expanded by inclusion of a "Monitoring and Surveillance" domain – hence the use of the term NOURISHING (plus) – to ensure all potential policy actions identified in the literature review were considered.

Firstly, the desired attributes of food definition systems for each of the food policy applications in the NOURISHING (plus) framework were considered and tabulated for transparency.

Next, the attributes of current 'unhealthy' and 'healthy' food definition systems were identified from the results of the systematic literature review and tabulated. These attributes were then mapped against the desired attributes for each potential food policy application in the NOURISHING (plus) framework. A colour coding schema was developed and applied to score the degree of alignment between the desired and actual attributes of current 'unhealthy' and 'healthy' food definition systems. The highest scoring 'unhealthy' food definition/s and classification systems for each policy application was/were deemed to be the most promising fit-for-purpose definition/s and classification system/s in each setting and environment.

Consideration was also given to the effect of any identified limitations of the methodology on assessment of the attributes of all definitions and food classification systems and, if necessary, this was captured and reflected in the results tables in a transparent manner.

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[10] Given the wide range of potential nutrition policy actions identified in the literature, a single definition of 'unhealthy' food may not be suitable for all applications.

5 Results

5.1. Part A: Results of literature search of peer reviewed reviews

The primary research question is: How are countries, comparable to Australia, differentiating 'healthy' and 'unhealthy' (discretionary) food and drinks for application in nutrition policy actions?

The PRISMA diagram for the systematic literature review of peer-reviewed reviews for stated definitions of 'unhealthy' and 'healthy' food and drinks and synonyms and related information is included at Figure 2.

The yields of each database search are included at Appendix 1A.

Most articles that were screened in full text (78%) were excluded under the criterion of "Any review that does not define or differentiate between 'healthy' and 'unhealthy' food and drinks or their synonyms in the text of the review". These articles commonly focused on "healthy eating" or "healthy diets" but did not attempt to define these broad terms nor any of the synonyms of interest in this review.

Table 2 describes the 81 peer-reviewed articles that were included in this review.[11] The detailed data extraction table for the included reviews is included at Appendix 2A.

The majority of included reviews (58%) were international in scope with a dominance from the USA, including a high proportion of reviews focussing on the USA only (26%) and a high proportion of first authors (46%) residing in the USA (Table 2). Of the 81 included reviews, only five (6%) were meta-analyses and 34 (42%) were systematic reviews, of which only one [3] dealt specifically with the review of the definitions of the healthiness of foods, and focussed specifically on the application of nutrient profiling systems. Most included systematic reviews attempted to answer a research question around the relationship of consumption of healthy or unhealthy food and drinks and specific outcomes, which required defining food and drinks as 'healthy' or 'unhealthy' to aid classification in subsequent analysis. One third of the included peer-reviewed papers were commentary (narrative) reviews.

More than half covered more than one area of nutrition policy application, with the 171 applications mentioned covering a balanced spread of the potential action areas of the NOURISHING framework (WCRF 2019), with four (2%) including the additional category of monitoring and surveillance policy action (Table 2).

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[11] Most fields could include more than one response, so the totals in each section may not equal 100%.

Figure 2: PRISMA diagram for the systematic literature review of peer-reviewed reviews for stated definitions of 'unhealthy' and 'healthy' food and drinks and synonyms and related information

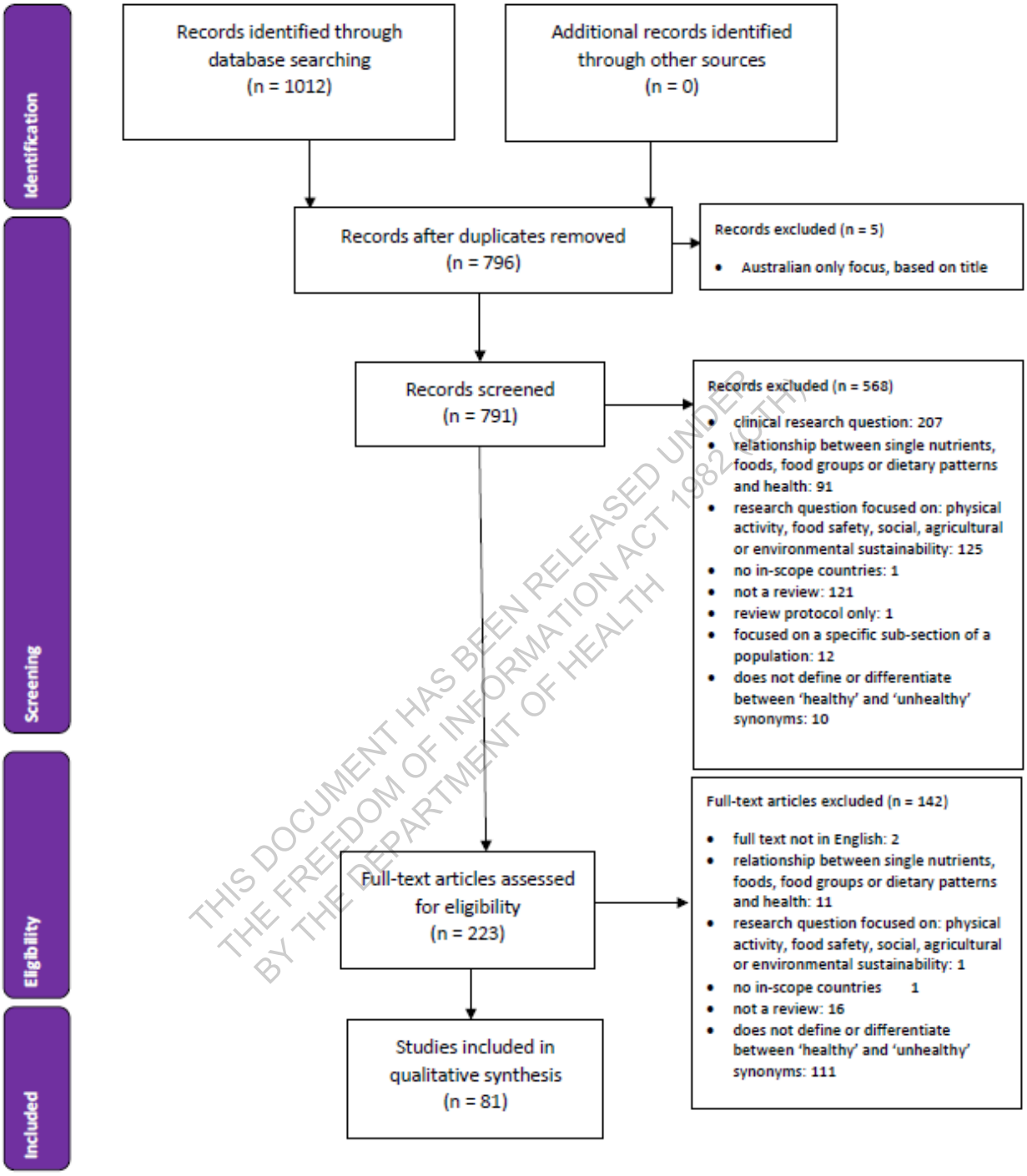

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Table 2. Overview of review articles included in the peer-reviewed literature search (n=81)

	n	*%*
Type of review		
Systematic review	34	42%
Meta-analysis	5	6%
Scoping review	10	13%
Rapid (umbrella) review	1	1%
Position statement	4	5%
Commentary	27	33%
Countries included in review scope		
International scope	47	58%
USA only	21	26%
Non-USA country only	13	16%
Country of first author		
USA	37	46%
England	10	13%
Australia	7	8%
Other country	27	33%
Number of nutrition policy action review focused on		
One area only	36	44%
More than one area	45	56%
Type of nutrition policy action review focused on (n=171)		
N. Nutrition label standards and regulations on the use of claims and implied claims on food	23	13%
O. Offer healthy food and set standards in public institutions and other specific settings	27	16%
U. Use economic tools to address food affordability and purchase incentives	29	17%
R. Restrict food advertising and other forms of commercial promotion	16	9%
I. Improve nutritional quality of the whole food supply	20	12%
S. Set incentives and rules to create a healthy retail and food service environment	18	11%
H. Harness food supply chain and actions across sectors to ensure coherence with health	6	4%
I (2). Inform people about food and nutrition through public awareness	17	10%
N (2). Nutrition advice and counselling in healthcare settings	4	2%
G. Give nutrition education and skills	7	4%
M&S. Monitoring and surveillance	4	2%

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5.2. Part A: Results of literature search of international and national websites

The primary research question was: How are countries, comparable to Australia, differentiating 'healthy' and 'unhealthy' (discretionary) food and drinks for application in nutrition policy actions?

5.2.1. International-level websites

Eleven international websites were searched using the search terms, which resulted in 17,234 webpages, of which 726 were screened. From the screened webpages, 32 were deemed eligible and data were extracted. Table 3 describes the 32 webpages from international websites that were included in the review. The detailed data extraction table is included at Appendix 2B.

The main purpose of the included webpages (41%) was to provide information to the general public or food industry groups (Table 3).[12] Of these 32 webpages, four (12%) contained details of a voluntary commitment from a food industry company. Half covered more than one area of potential nutrition policy application; informing people about food and nutrition through awareness was the most dominant (16%).

Table 3. Overview of webpages included in the international-level search (n=32)

	n	*%*
Purpose of webpage		
To provide information to the general public and/or industry	13	41%
To summarise available evidence	8	25%
To guide policy development	6	19%
Media release	1	3%
To publish a commitment from a food industry company	4	12%
Number of nutrition policy action webpage focused on		
One area only	16	50%
More than one area	16	50%
Type of nutrition policy action review focused on (n=87)		
N. Nutrition label standards and regulations on the use of claims and implied claims on food	4	5%
O. Offer healthy food and set standards in public institutions and other specific settings	9	10%
U. Use economic tools to address food affordability and purchase incentives	5	7%
R. Restrict food advertising and other forms of commercial promotion	7	8%
I. Improve nutritional quality of the whole food supply	10	11%
S. Set incentives and rules to create a healthy retail and food service environment	8	9%
H. Harness food supply chain and actions across sectors to ensure coherence with health	4	5%
I (2). Inform people about food and nutrition through public awareness	14	16%
N (2). Nutrition advice and counselling in healthcare settings	9	10%
G. Give nutrition education and skills	7	8%
M&S. Monitoring and surveillance	10	11%

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[12] Most fields could include more than one response, so the totals in each section may not equal 100%.

5.2.2. National-level websites

Thirty-nine national-level websites were searched using the search terms, which resulted in 5,976 pages resulting from the key term search, of which 930 were screened. From the screened webpages, 36 pages were deemed eligible. In addition, 61 webpages were screened in the initial hand search, which identified two eligible webpages. Finally, 84 entries were found in the NOURISHING database for the 39 in-scope countries. In total, 122 webpages were deemed eligible and data were extracted from these.

Table 4 describes the 122 webpages from national websites that were included in the review.[13] The detailed data extraction table is included at Appendix 2C.

The majority of included national webpages (89%) focussed on application in only one potential nutrition policy action area (Table 4). In contrast to the international webpages, there was a dominance of application of economic tools to address food affordability (20%) and nutrition food labelling standards on the use of health claims (17%) with little information on over half of the potential nutrition policy action areas of the NOURISHING framework (Table 4).

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Table 4. Overview of webpages included in the national-level search (n=122)

	n	*%*
Language on website		
Not available in English (relied on Google translator)	8	21%
English version available	31	79%
Number of nutrition policy action webpage focused on		
One area only	109	89%
More than one area	13	11%
Type of nutrition policy action review focused on (n=139)		
N Nutrition label standards and regulations on the use of claims and implied claims on food	23	17%
O Offer healthy food and set standards in public institutions and other specific settings	51	37%
U Use economic tools to address food affordability and purchase incentives	28	20%
R Restrict food advertising and other forms of commercial promotion	18	13%
I Improve nutritional quality of the whole food supply	5	4%
S Set incentives and rules to create a healthy retail and food service environment	7	5%
H Harness food supply chain and actions across sectors to ensure coherence with health	1	1%
I (2) Inform people about food and nutrition through public awareness	6	4%
N (2) Nutrition advice and counselling in healthcare settings	0	0%
G Give nutrition education and skills	0	0%
M&S Monitoring and surveillance	0	0%

[13] Most fields could include more than one response, so the totals in each section may not equal 100%.

5.3. Part B: Synthesis of results

5.3.1. Taxonomy for classification of terms

In order to synthesise the findings of the literature review, food classification systems were grouped and coded. The taxonomy developed for classification of 'unhealthy' and 'healthy' food and drinks and synonyms described in the peer reviewed literature and websites is provided in Table 5. In each category, the top-level term is characterised by an alphabetical code in the taxonomy which reflects the principle definition extracted from the included peer-reviewed reviews (Appendix 2A) and/or websites (Appendix 2B and Appendix 2C). The letter "U" depicts 'unhealthy' food and drinks and the letter "H" depicts 'healthy' food and drinks. Secondary and subsequent definitions extracted in the literature review are captured under each top-level term and characterised by a numerical code in the taxonomy.

The broad categories of terms and definitions for 'unhealthy' food and/or drinks include:

- Descriptive synonyms (category code UA) – definitions where the principal term was descriptive in nature. Among this category, multiple definitions (UA3) included those where several characteristics were applied equally, for example unhealthy food and drinks were described as being "nutrient-poor and junk".
- Discretionary (category UB) – definitions where the principal term was "discretionary". For example, UB1 differs from UA1 in that the principle descriptor of the former is "discretionary" with a secondary term of "energy-dense, nutrient-poor" whereas the principle descriptor of the latter is "nutrient-poor and/or energy dense" and no secondary term was applied.
- Ultra-processed/Processed (category UC) – definitions where the principle term reflects the degree of processing of the food or drinks. In this category, the first subcategory (UC1) includes definitions of "ultra-processed" foods that referenced the NOVA system, which classifies food and drinks in four categories: unprocessed or minimally processed foods, processed culinary ingredients, processed foods, and ultra-processed foods.
- Nutrient profiling systems (category UD), which classify or rank foods according to their selected nutrient composition.
- Other – food habit focussed (category UE), which tend to reflect the manner in which the food is consumed and, despite inherent assumptions, may not necessarily indicate the 'healthiness' of the product. For example, 'snacks' could be 'unhealthy' such as potato crisps, or 'healthy' such as an apple.
- Other – sugar and sugar-sweetened beverages (SSBs) (category UF), which focuses on sugar specifically, with subcategories centred on specific terms, for example "free sugars" and "added sugars".
- Other – food-based dietary guidelines (category UG1) which tend to lack specific terms for 'unhealthy' food and drinks and are text heavy, such as providing long explanation of different categories combining food and nutrient descriptors
- Other – none (category UH), where the term 'unhealthy' food and drinks was used without further definition.

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The categories of terms and definitions for 'healthy' food and/or drinks tend to be the inverse of those for 'unhealthy' food and/or drinks.

The taxonomy category codes outlined above and in Table 5 were used to present the results of the literature search in subsequent tables.[14]

Table 5. Taxonomy of terms used to differentiate 'healthy' and 'unhealthy' food and drinks

Unhealthy (U) food and/or drinks and synonyms		Healthy (H) food and/or drinks and synonyms	
Category code	Terms	Category code	Terms
Descriptive synonyms		**Descriptive synonyms**	
UA1	Nutrient-poor and/or energy-dense Low in positive nutrients	**HA1**	Nutrient rich and/or low energy density High in positive nutrients
UA2	High in negative nutrients e.g. high fat, high sat fat, high sugar	**HA2**	Low in negative nutrients e.g. low fat, low sugar
UA3	Multiple descriptive definitions applied equally	**HA3**	Multiple definitions
UA4	Food examples	**HA4**	Food examples
UA5	Inverse of "nutritious"/'healthy' e.g. "competitive"	**HA5**	Inverse of 'unhealthy'
Discretionary		**Core**	
UB1	Energy-dense, nutrient-poor	**HB1**	Nutrient rich and/or low energy density
UB2	Reference to ADGs (or other DGs) but appears to be a non-standard definition	**HB2**	Reference to ADGs (or other DG) but appears to be a non-standard definition
UB3	Discretionary energy/calories/kJ	**HB3**	Non-discretionary energy/calories/kJ
UB4	As per NHMRC (or other DGs) definition	**HB4**	As per NHMRC (or other DGs) definition
Ultra-processed/ Processed		**Unprocessed/Minimally processed**	
UC1	Ultra-processed per the NOVA classification	**HC1**	Minimally processed /unprocessed per the NOVA classification
UC2	Highly processed/ processed but no definition provided	**HC2**	Minimally processed/unprocessed/'natural' but no definition provided
UC3	Packaged foods	**HC3**	Unpackaged foods
UC4	Processing term used but level not specified	**HC4**	Processing term used but level not specified
Nutrient profiling		**Nutrient profiling**	
UD1	Nutrient-poor foods; no mention of profiling system or cut-offs provided. Also "not eligible for health claim"	**HD1**	Nutrient rich foods; no mention of profiling system or cut-offs provided. Also "Health Claim eligible"
UD2	Nutrient cut–offs provided across the 'healthy' continuum; may also apply system-level cut-points	**HD2**	Nutrient cut–offs provided

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[14] See Table 7, Table 9, Table 10, Table 11, Table 13, Table 14 and Table 15.

Unhealthy (U) food and/or drinks and synonyms		Healthy (H) food and/or drinks and synonyms	
Category code	Terms	Category code	Terms
UD3	Refers to nutrient profiling system, but specific details not provided	**HD3**	Refers to nutrient profiling system, but specific details not provided
UD4	Refers to nutrient profiling system, and 'healthier' vs 'less healthy 'foods - range of models	**HD4**	Reviews nutrient profiling systems (discusses healthier vs healthy foods)
Other- food habit focussed		**Other- food habit focussed**	
UE1	Fast food	**HE1**	Slow food
UE2	Out-of-home eating	**HE2**	Home cooked food
UE3	Ready-to-eat meals/prepared foods		
UE4	Snacks		
Other - Sugar and sugar-sweetened beverages (SSBs)		**Other – reduced sugar**	
UF1	Added sugar	**HF1**	Reduced added sugar
UF2	Free sugars		
UF3	High sugar foods		
UF4	Sugar sweetened beverages, energy drinks, fruit juices	**HF4**	Healthy drinks (meaning no added sugar)
UF5	Artificially sweetened beverages		
Other – food-based dietary guidelines (text heavy)			
UG1	Food-based only		
UG2	Food-based and only negative nutrients		
UG3	Food-based and only positive nutrients		
UG4	Food-based and positive and negative nutrients		
UG5	Nutrient-based only		
Other - None			
UH	No clear term or definition provided		

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5.3.2. Analysis of key reviews assessing specifically the strengths and limitations of various food classification systems

Nine included reviews assessed specifically the strengths and limitations of various food classification systems and are listed in Table 6.[15] Of these, six focussed on nutrient profiling systems; however only one of these (Labonte et al 2018) was a systematic review. Of the six commentary (narrative) reviews, only one focussed on ultra-processed foods and the NOVA system.[16] Four commentary reviews focussed on nutrient profiling systems, and the fifth focused on stakeholders' perspectives on application of nutrition quality

[15] The data from each of these reviews is also include with other results in Table 7.
[16] As explained under Limitations of the study (section 6.1.2) and identified transparently in other relevant sections of this report, a very recent review of the NOVA classification published by the Food and Agricultural Organization of the United Nations [106] was also considered subsequently to enhance the utility of the findings of this report.

metrics, specifically in the USA Supplemental Nutrition Assistance Program (SNAP) using dietary sugars as an example. The only included relevant scoping review focused on definitions of dietary sugars (Table 6).

Detailed findings of relevant reviews are included in sections 5.3.2.1 and 5.3.2.2 below.

Table 6. Key reviews assessing specifically the strengths and limitations of various food classification systems

Authors (date)	Title	Citation	Comment
Labonte ME et al (2018)	Nutrient profile models with applications in government-led nutrition policies aimed at health promotion and non-communicable disease prevention: A systematic review.	Adv Nutr 9:741–788.	Systematic review identifies 387 potential nutrient profiling models
Nicklas T, (2009)	Nutrient profiling: the new environment.	J Am Col Nutr 28:4, 416S-420S	Commentary review focussing on nutrient profiling systems
Foltran F et al (2010)	Nutritional profiles in a public health perspective: a critical review.	J Int Med Res 38:318-385	Commentary review focussing on nutrient profiling systems
Lobstein T and Davies S (2008)	Defining and labelling 'healthy' and 'unhealthy' food.	Pub Hlth Nutr 12(30, 331-340	Narrative review focussing mostly on nutrient profiling systems
Roodenburg AJC et al (2011)	Development of international criteria for a front of package food labelling system: the international choices program.	Eur J Clin Nutr 65, 1190-1200	Commentary review of nutrient profiling systems for food labelling, to inform development of another specific model
Swinburn B and Wood A (2013)	Progress on obesity prevention over 20 years in Australia and New Zealand.	Obesity Reviews 14 (sup 2) 60-68	Commentary review focussing on policy actions including those dependent on definitions of 'unhealthy' and 'healthy' food and drinks, mostly nutrient profiling
Gibney M et al (2017)	Ultra-processed foods in human health - a critical appraisal.	Am J Clin Nutr 106:717-24	Commentary review of NOVA classification system
Schwartz MB (2017)	Moving beyond the debate over restricting sugary drinks in the supplemental nutrition assistance program.	Am J Prev Med 52 (2S2):S199-S205	Commentary review focussing on different stakeholder perspectives on application of nutrition quality metrics (mainly restriction of sugary drinks) to the SNAP program. Notes need to restore trust between stakeholders. Not analysed in additional detail for this project, but may be of interest to some readers.
Hess J et al (2012)	The confusing world of dietary sugars: definitions, intakes, food sources and international dietary recommendations.	Food Funct 3, 477-486	Scoping review focussing on definitions of dietary sugars and applications. Not analysed in additional detail for this project, but may be of interest to some readers.

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5.3.2.1 Detailed summary of findings of systematic reviews investigating the definition of 'unhealthy' and 'healthy' food and drinks and synonyms (Labonte et al 2018)

Only one systematic review [3] investigating the definition of 'unhealthy' and 'healthy' food and drinks and synonyms was identified in the search of peer reviewed literature. This systematic review dealt specifically with nutrient profiling systems. The supplementary tables summarising the detailed findings of Labonte et al

are included at Appendix 3 (Table A3.1). The full details[17] of the findings are included at Appendix 3 (Table A3.2). The quantitative results of secondary analysis of the findings of Labonte et al (2018), including the number of nutrient profiling system models and characteristics identified for different applications, are included in Table 7. These data illustrate the very large number and variation of different nutrient profiling systems applied globally.

The primary aim of the systematic literature review by Labonte and colleagues was to identify nutrient profiling models for application specifically in government-led nutrition related policies aimed at health promotion and non-communicable disease prevention. The review was conducted in 2016 and included models that classified individual foods according to more than one nutrient or food component, and were endorsed by a government body.

In total, 387 potential nutrient profiling models were identified, compared to the 119 found in a previous review in 2013, illustrating the proliferation of different nutrient profiling systems for different purposes globally. Seventy-eight nutrient profiling models met the study aim and were included; the number of models for application specifically in government-led nutrition related policies aimed at health promotion and non-communicable disease prevention identified had tripled since the earlier review and several new applications were also identified. Of the 309 that were not included, 164 (53%) were excluded as they were not developed/endorsed by a government body.

Twelve primary applications were identified, the most common being for: school food standards (n=27, 35%); front of pack food labelling (n=12, 15%); restriction of marketing to children (n=10, 13%); regulation of health or nutrition claims (n=7, 9%); and food standards in health facilities (n=5, 6%).

Two-thirds of the models originated from the following countries: United States (n = 19); Canada (n = 13); Australia (n = 10, of which 2 models were developed jointly with New Zealand); United Kingdom (n = 5); and for international application (n = 5; e.g. models by regional offices of the WHO).

Nearly three-quarters (73%; n=57) of the included models had been developed since 2007, with 35% (n=27) introduced since 2012. More than 40% (n=34) had been derived from another model included in the review, suggesting that the adoption or adaptation by government bodies of an already existing model is becoming a more frequent practice, as per the recommendations of the WHO cited in the review.

Seventy-one of the included models (91%) provided summary ratings of the nutritional quality of food products based on the amounts of two or more nutrients or food components. Three models (4%), all developed for food labelling, solely provided separate ratings of multiple nutrients. Four models (5%) included nutrient-specific ratings combined with a summary rating of the nutritional quality of food products (two of which were for food labelling, one for the restriction of marketing to children, and one for food systems/surveillance); an example is Australia and New Zealand's Health Star Rating (HSR) system.

Seventy models (90%) provided output classification, for example the WHO model[18] identifies foods as eligible/not eligible for marketing to children based on pre-specified thresholds.

One model, the UN World Food Program Nutrient Value Score[19], provided a sole numerical score. Seven models, applied for regulation of health claims (n = 3), restriction of marketing to children (n = 2), or food labelling (n = 2), used classifications based on pre-specified thresholds following the calculation of a score.

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[17] The research team sought the unpublished information presented in Table A3.2 from the authors. The original review by Labonte et al [3] did not present all of the extracted data, but noted that a searchable database including all possible fields, to provide information and facilitate comparison of the components and constructs of different nutrient profiling models, was to have been made available online at http://labbelab.utoronto.ca.
[18] Model number 335 in Labonte et al 2018 [3]
[19] Model number 254 in Labonte et al 2018 [3]

An example of this approach is the UK Ofcom model[20] defining ”less healthy foods or drinks,” in which foods with a score ≥4 and beverages with a score ≥1 are not allowed to be advertised on television.

A relevant finding was that food categories were not described in a consistent manner in the different nutrient profiling models included. 33 models (42%) were described as including only a single level of food category (i.e., major food category), but the number of food categories included in the models ranged between one and 15 (for example, the Ofcom model uses two categories: foods and drinks). 45 models included at least one subcategory in addition to major categories (for example the WHO model where the major category of beverages is divided into juices, milk drinks, energy drinks, and other beverages).

The number of food categories with different nutritional criteria within a given model (combining the major categories, subcategories & sub-subcategories if applicable) ranged between one and 99. The largest variations (minimum to maximum) in this number were observed in models related to school food (two to 73), regulation of health claims (one to 99), and food labelling (two to 99) (Table 7).

Sixty models (77%) included different types of nutrients and food components that varied across the food categories or types of food product evaluated; these were primarily applied in food service applications, such as in schools.

All 78 included nutrient profiling models comprised between two and 12 nutrients or food components for which it was noted that consumption should be limited (Table 7); the most common were sodium (91% of models), saturated fatty acids (83% of models), and total sugars (73% of models). Other nutrients listed for limitation included total fat, cholesterol, energy, trans fat, free/added sugar, added fat and added sodium. No food components were listed as being limited. Free or added sugars were among the top nutrients to limit in models primarily meant for use in vending machines and food assistance programs.

Sixty-seven models (86%) included between one and 15 nutrients or food components for which it was noted that consumption should be encouraged. The most common were “fruits, vegetables, nuts, and legumes” (FVNL) (64% models), fibre (63% models), and protein (43% models). Other commonly perceived ‘positive’ nutrients and food components included whole grain, calcium, milk/dairy based content, vitamin D, water, energy and small serving size.

The appraisal of food components/ingredients according to their presence or absence in a product (for example, no added sweeteners) or to their position in the ingredient list (for example, first ingredient must be a whole grain) was also highly prevalent (64% of models).

Different reference units were identified, with the most common examples including per serving (n=59, 76%), per 100 g (n=47, 60%; with per 100 mL in 23 models), per 419 kJ (100 kcal) and/or % of energy (n = 12, 15%). Most nutrient profiling models (n = 68, 87%) considered two or more different types of reference amounts or other evaluation units.

No validity testing could be identified for 58% (n=45) of the nutrient profiling models- attempted validation was generally higher for application in food regulatory work than in food service settings. No gold standard was identified. 31% (n=24) reported construct/convergent validity against another food classification system. Only 10% (n=8) used some degree of criterion (predictive) validity testing – the most robust form of validation. However 70-75% of models for restricting marketing, regulation of claims and vending machines standards claimed validation. The UK Ofcom model was identified as the most frequently validated model.

The systematic review observed wide variations in the number and nature of food categories, in the number and types of nutrients and food components “to limit” and “to encourage” and in the number and types of

[20] Model number 5 in Labonte et al 2018 [3]

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reference amounts considered in the various nutrient profiling models' algorithms. Wide variations were found both between models as a whole, and between models developed for the same application. Three papers were cited as having considered the implications of variations apparent in nutrient profiling systems, such as the choice of food categories and other characteristics [18-20]. The review noted that Verhagen and van den Berg [21] proposed a useful tool to visualise differences between nutrient profiling models in terms of the main characteristics related to their development and adaptation. It found that nutrient profiling is a rapidly evolving field in which current models might be updated and new models might be proposed at almost any moment. The conclusion of the systematic review was that, given the proliferation of nutrient profiling models worldwide, an interactive tool needed to be developed "to assist health professionals and policy makers in the selection of an appropriate model when the establishment of nutrition-related policies requires the use of nutrient-profiling" [3].

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Table 7. Secondary analysis of the findings of Labonte et al (2018): number of nutrient profiling system models and characteristics identified for different applications

Application	Type of model (1)	Output (2)	Category level(s) at which nutrient criteria are applied (3)	Number of food categories with nutrient criteria	Model include nutrients/ food components to limit: only (A) OR to limit and to encourage (B)	Number/type of nutrients and food components may vary across model's food categories/ types of food product evaluated (Y/N)	Total nutrients/ food components to encourage (range)	Total nutrients /food components to limit (range)	Type of reference amount/unit considered				
									Per 100g and/or per 100ml	Per 419 KJ (i.e. 100kcal) or % energy	Per serve	Other reference amount or unit	Number of types of reference amount /unit considered
School food (n = 27)	A = 27	A = 27	M = 5 Ms = 12 S = 9 Ss = 1	2-73	A = 2 B = 25	Y = 26 N = 1	3-12	0-14	Y = 12 N = 15	Y = 3 N = 24	Y = 24 N = 3	Y = 21 N = 6	1 = 2 2 = 17 3 = 8
Front-of-pack food labelling (n = 12)	A = 7 B = 3 C = 2	A = 10 C = 2	M = 6 Ms = 2 Mss = 1 S = 2 Ss = 1	2-99	A = 3 B = 9	Y = 6 N = 6	4-12	0-8	Y = 10 N = 2	Y = 4 N = 8	Y = 7 N = 5	Y = 7 N = 5	1 = 4 2 = 2 3 = 4 4 = 2
Restriction of marketing to children (n = 10)	A = 9 C = 1	A = 8 C = 2	M = 6 Ms = 3 Mss = 1	1-31	A = 4 B = 6	Y = 7 N = 3	2-8	0-8	Y = 8 N = 2	Y = 1 N = 9	Y = 3 N = 7	Y = 8 N = 2	1 = 2 2 = 6 3 = 2
Regulation of claims (n = 7)	A = 7	A = 4 C = 3	M = 6 Ss = 1	1-99	A = 1 B = 6	Y = 2 N = 5	3-11	0-8	Y = 6 N = 1	Y = 3 N = 4	Y = 5 N = 2	Y = 4 N = 3	1 = 1 2 = 3 3 = 1 4 = 2
Health facilities (n = 5)	A = 5	A = 5	M = 3 Mss = 2	3-9	B = 5	Y = 5	3-9	1-2	Y = 3 N = 2	N = 5	Y = 5	Y = 5	2 = 2 3 = 3
Government facilities (n = 4)	A = 4	A = 4	M = 1 Ms = 2 Mss = 1	3-27	B = 4	Y = 4	3-10	2-5	Y = 1 N = 3	N = 4	Y = 4	Y = 4	2 = 3 3 = 1
Vending machines (n = 4)	A = 4	A = 4	M = 3 Ms = 1	5-14	B = 4	Y = 4	4-12	1-5	Y = 1 N = 3	N = 4	Y = 4	Y = 4	2 = 3 3 = 1

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Application	Type of model (1)	Output (2)	Category level(s) at which nutrient criteria are applied (3)	Number of food categories with nutrient criteria	Model include nutrients/ food components to limit: only (A) OR to limit and to encourage (B)	Number/type of nutrients and food components may vary across model's food categories/ types of food product evaluated (Y/N)	Total nutrients/ food components to encourage (range)	Total nutrients /food components to limit (range)	Type of reference amount/unit considered				
									Per 100g and/or per 100ml	Per 419 KJ (i.e. 100kcal) or % energy	Per serve	Other reference amount or unit	Number of types of reference amount /unit considered
Recreational facilities (n = 3)	A = 3	A = 3	M = 2 Mss = 1	2-9	B = 3	Y = 2 N = 1	4-6	1-2	Y = 2 N = 1	Y = 1 N = 2	Y = 3 N = 7	Y = 2 N = 1	2 = 1 3 = 2
Food assistance programs (n = 2)	A = 2	A = 2	M = 1 Ms = 1	15-22	B = 2	Y = 2	7-12	14-15	Y = 2	N = 2	Y = 2	Y = 2	3 = 2
Food systems/surveillance (n = 2)	A = 1 C = 1	A = 1 B = 1	M = 2	1-4	A = 1 B = 1	N = 2	2-4	0-9	Y = 1 N = 1	N = 2	Y = 1 N = 1	N = 2	1 = 2
Consumer education (n = 1)	A = 1	A = 1	S = 1	25	B = 1	Y = 1	11	7	N = 1	N = 1	Y = 1	Y = 1	1 = 2
Taxation (n = 1)	A = 1	A = 1	Ms = 1	12	B = 1	Y = 1	6	1	Y = 1	N = 1	N = 1	Y = 1	1 = 2

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Table 7 legend		
1. Type of model: A = provides a summary indicator B = provides a range of nutrient specific indicators C = combination of both	2. Output: A = classification B = score C = combination of both	3. Category level(s) at which nutrient criteria are applied: M = major Ms = Major, sub Mss = Major, sub, sub-sub S = Sub Ss = Sub, sub-sub

5.3.2.2. Detailed summary of findings of non-systematic reviews investigating the definition of 'unhealthy' and 'healthy' food and drinks and synonyms

A summary of the findings of the commentary reviews is included below. Five commentary reviews considered nutrient profiling systems [11, 22-25]. Only one review [26] considered ultra-processed foods and the NOVA classification system.

Given the aim of this project, the two reviews that focused on sugar definitions specifically [27, 28] were considered limited in scope; the information in these papers is included in synthesis tables (Table 8 and Table 10) but is not summarised in detail below.

5.3.2.2.1.

The key finding of Foltran and colleagues (2010) was that current nutrient profiling systems and standards produce inconsistent results in classifying the healthiness of food and drinks and that more research is needed. The review noted that creating a composite nutritional quality index for individual foods raises a number of methodological issues, including the selection of index nutrients, the choice of reference daily value and the choice of reference amounts; for example per 100 g, 100 kcal, or serving size. It was noted that all indices need to be validated against an accepted independent measure of diet quality.

The review identified that modelling and creating nutrient profiles involves the definition of a set of targets, such as: (i) the purpose for which the model is to be used; (ii) the group or population that the model is relevant to; (iii) the appropriateness of specific criteria; (iv) the decision on how and if to include specific food components; and (v) the choice of reference amounts to use.

No universally acceptable food categories were identified. The review noted that whether the descriptor is absolute (such as 'healthy') or relative (such as 'less healthy'), when the general characteristic of the food is being described, the number of different combinations of nutrient and food components in nutrient profiling systems can be considerable. However, it was noted that most models prioritise nutrients based on consumption or public health importance in specific applications (for example, iron and protein when considering meat group for consumption by children).

The review, written in 2010, identified that: per 100 g was the most common reference measure used in nutrient profiling models; that two or more food categories were most commonly used for food labelling and that continuous scoring or ranking of foods approaches could be converted into categorical systems by setting score threshold criteria; but that validation of nutritional profiling models were seldom proposed and that there was no consensus on the best statistical method for assessing the validity of such dietary tools.

Among the schemes proposed in the literature, the review noted that five had been accepted as reference standards in their respective categories: the 'A Little, A Lot' Scheme (UK, Ministry of Agriculture, Fisheries and Food); the 'USA Health Claims' Scheme (USA, FDA); the Tripartite Classification Model; the 'FSA Scoring System for Children' (UK, FSA); and the Center for Science in the Public Interest (CSPI) Guidelines for Responsible Food Marketing to Children (GRFMC) Scheme. Comparison of performance tests of these five schemes showed that results were inconsistent for nearly half of the food products selected, even for basic foods such as bread or pasta, and the reviews expressed concerns about universal adoption of the models.

The reviewers noted that the more restrictive the definition of 'healthier' foods, the higher the risk of not classifying foods that do positively contribute to the 'healthy diet' as 'healthier', but the lower the risk of classifying foods that do not positively contribute to the 'healthy diet' as 'healthier'. They went on to note that, in food profiling, a key issue is the correct classification of food within a given profile, but that comparisons were made usually with the diet of a less than perfect eating population, implying that the bar was set quite low.

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The authors noted that nutritional profiles are easy to conceptualize yet difficult to assess quantitatively. They found that determination of a causal link between nutritional profiles and health status was lacking- and that many recommendations on nutritional profiles had no solid epidemiological basis. The review found no scientific agreement on how to determine the nutritional profile of any given food, and that the construction of a nutrient profiling model should be influenced mainly by the characteristics of the final user (that is, demographic, socio-economic or educational factors). They concluded that there was little evidence for application of nutrient profiling systems in food labelling or advertising, and that the lack of validity testing of different models made it difficult to adopt one scheme over another.

5.3.2.2.2. Published 10 years ago, the review by Lobstein and Davies (2009) [11] explained that nutrient profiling methods comprise different systems using different nutrients across different food categories and, therefore, can't be compared across categories or models. The authors supported the approaches underpinning the colour-coded 'traffic light' signalling on food labels. They also supported the approach used by the UK broadcasting regulator Ofcom to limit advertising to children. This model provides a single score derived from the energy, saturated fat, sugars and sodium on one hand, and the amount of protein, fruit, vegetables and nuts on the other, with a threshold value for the combined score set per 100g.

The authors noted that schemes that provide relative comparisons within food categories may have limited use, as they do not clearly identify less-healthy foods, but are used to attract consumers towards products with 'supposedly' better health profiles. They explained that 'healthier' does not necessarily mean 'healthy' per se, and notions of 'better than' may mislead consumers away from what is best.

Another problem they identified was that nutrient profiling schemes do not uniformly identify foods which should be eat more (for example, unpackaged fruit and vegetables) and rarely draw attention to foods that should be consumed less (for example, by use of logos to identify such foods).

While the review identified that the traffic-light scheme worked best to help consumers assess nutrient levels and compare products and provided an incentive for manufacturers to reformulate products, it acknowledged that explaining to consumers how the nutrient content of an individual food product related to government dietary guidelines was challenging. It noted that foods are composed of combinations of many nutrients and ingredients, and attempts to summarise them quantitatively into a single score, a set of scores, or even a set of ranges of scores, is bound to lead to the loss of some valuable information.

The authors conclude that the challenge was to agree on a consistent, industry-wide approach at the national and international levels, and use this as the basis of a broad range of actions and initiatives to tackle obesity and diet-related disease.

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5.3.2.2.3. The review by Nicklas (2009) [25] argued that nutrient density should be the guiding principle for promoting healthier diets and should be included in nutrient profiling models, and that there needed to be a focus on foods and more consumer research. The authors noted that the 2005 American Dietary Guidelines, health professionals and nutrition organisations support the concept of consuming nutrient-dense foods to help meet nutrient needs without exceeding caloric needs. They called for the establishment of a standardised, practical definition of nutrient density that was relevant to consumers and helped inform food choices and healthier diets.

The review argued that the introduction of numerous profiling systems raised new research questions and considerations and further supported the need for consumer research and a unified definition of nutrient density. It proposed that a mixed nutrient profiling system may provide a more holistic and balanced health profile of a specific food item than one focusing solely on nutrients to encourage or nutrients to limit; however noted that the rationale for inclusion/exclusion of different nutrients was not clear.

5.3.2.2.4. The review by Roodenburg and colleagues (2011) [23] describes the development of the nutrient profiling model that underpins the International Choices Program (ICP), a generic, global front-of-pack nutrition logo system, first introduced in the Netherlands in 2006 that aims to help consumers make healthier food choices and stimulate product reformulation. The ICP is a product-group-specific nutrient-profiling approach that distinguishes between basic and discretionary food groups.

The basic product groups are consistent with food-based dietary guidelines from more than 20 countries. Generic criteria are derived from international nutrient recommendations for trans fatty acids, saturated fatty acids, sodium, added sugar, fibre and energy. Food categories are further refined to meet regional and country-specific needs. The review states that the resulting criteria are reviewed regularly to ensure alignment with international dietary patterns, new scientific insights and current developments within the food market.

An emphasis on healthy choices in basic product groups is encouraged by setting the criteria for discretionary foods at a more restrictive level than for basic foods. Some interesting technical specifications include: the source of fibre must originate from actual ingredients in the product group (for example, wholegrains or vegetables); fresh fruit and vegetables, fresh potatoes and water are all eligible to carry the Choices logo; the generic criteria may vary by an additional 30% to accommodate flexibility; a “level of insignificance” criterion ensures that low energy-dense products would not be needlessly excluded, and the energy criterion is different for basic and discretionary foods and drinks. Detailed nutrient criteria for basic and discretionary foods are provided in the review. The approach was being evaluated at process (consumer awareness) and impact (product innovation) level. Rigorous outcome (effectiveness) data are not available, but it is claimed that estimates suggest potential improvement of habitual nutrient intakes.

The nutrient criteria are ‘evaluated’ every three years by an independent scientific committee. This process takes into account the latest developments in nutrition science and food technology, as well as within the market place. The unique feature of this nutrient-profiling system is that its transparent decision framework enables international applicability and translation to other dietary patterns.

Roodenburg and colleagues noted that in the United States, the Institute of Medicine and the Food and Drug Administration were evaluating existing front-of-pack labelling systems following the failure of a multi-stakeholder initiative, the Smart Choices Program. They stated that this food industry-led program failed due to criticism that it allowed high sugar and high fat products to carry a healthy choice logo [29], and noted that this highlights the importance of having an independent scientific committee define criteria in nutrient profiling systems. The authors claimed that over 100 partners in food manufacturing, retail and food service had joined the ICP and that the logo was being adopted in several other countries globally.

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5.3.2.2.5. The review by Swinburn and Wood (2013) [24] supports the traffic-light nutrient profiling system for food labelling initiatives; it uses this topic to highlight food industry influences on nutrition policymaking in Australia.

The review notes that the UK nutrient profiling system was adapted by Food Standards Australia and New Zealand (FSANZ) to develop the Nutrient Profiling Scoring Criterion (NPSC) for the regulation of health claims in Australia and New Zealand; the NPSC is applied to define what are considered ‘healthy’ food and drinks to carry health and nutrient claims. The authors describe that, during development of an interpretative front of pack food labelling system in Australia and New Zealand, initial support for a UK style traffic-light system was overturned due to opposition from the Australian Food and Grocery Council, and that this resulted in a negotiated process between food industry and public health representatives which lead to the application of the NPSC to develop the “political compromise” of the voluntary Health Star Rating (HSR) system. The authors claim there is no evidence behind the HSR system. They compare this system with the

UK voluntary traffic-lights approach, which was backed by industries covering 60% of the food products sold in the UK, and postulate that the UK scheme will set the benchmark for other countries. They conclude by observing that the food industry has become both heavily embedded in the policymaking process (despite clear commercial conflicts of interest) and very successful at applying lobbying pressure to keep effective nutrition policies off the agenda in Australia and New Zealand [24].

5.3.2.2.6. The review by Gibney and colleagues (2017) [26] considers the NOVA food classification system based on food processing. It proposes that the system has some merit, but highlights and focuses critically on perceived challenges inherent in the system. The lead author declared that he served on the scientific committee for two food industry groups.

The nutrient-centric review notes that the NOVA classification of foods proposes four categories: unprocessed or minimally processed foods, processed culinary ingredients, processed foods (PFs), and ultra-processed food and drinks (UPFDs). The NOVA food classification approach was developed in Brazil; it has been incorporated into major international reports on diet and health and adopted by national governments within policies informed by food-based dietary guidelines. The premise of this approach is that UPFDs should be avoided and the intake of PFs should be minimised. UPFDs are heavily modified by the addition of salt, added sugar, fat and other substances to make this food category highly palatable. It is postulated that controlling food processing, rather than examining nutrients, should be foremost in shaping nutrition policy.

Gibney and colleagues argue that there is little advantage in the NOVA classification compared with the current nutrient-focused epidemiologic approach linking nutrient intakes to chronic disease to inform subsequent identification of foods for focus in public health strategies. The review notes that UPFDs are: “formulations of several ingredients which, besides salt, sugar, oils, and fats, include food substances not used in culinary preparations, in particular, flavours, colours, sweeteners, emulsifiers and other additives used to imitate sensorial qualities of unprocessed or minimally processed foods and their culinary preparations or to disguise undesirable qualities of the final product”. The authors critique that reference to salt, sugar, and fat lack cut-offs per gram, per portion size, or per unit of energy, and that the reference to food additives poses particular difficulty, because food additives may be legally permitted in foods but may, or may not, be present. The NOVA classification provides published lists of food types that might be included in each of its four categories. However, Gibney et al note that neither the terms used to define UPFDs nor the list of typical foods in each category of the NOVA system meet the normal standards set in established food classification. They claim that, compared to other food coding systems (such as Foodex, EPIC and LanguaL), NOVA is a rather simple and crude system of classifying foods into categories on the basis of their degree of processing. The authors note that claims of links between the NOVA system and obesity and the metabolic syndrome and its complications are likely related to overall energy intake, because the definition of UPFDs is based on the macronutrient contents of foods, and that therefore the NOVA system is not suited to contribute to research into overall adequacy of dietary patterns.

The review claims that the significance of industrial processing, and in particular methods and ingredients developed or created by modern food science and technology to protect human health (such as semi-skimmed milk, low-fat spreads, pre portioned calorie-controlled meals, or zero-energy beverages) is not appreciated by the proponents of the NOVA classification system, and that the approach offers no explanation as to how, or if, food processing in any way constitutes a risk to consumer health.

The review notes conceptual differences between food-based dietary guidelines recommended by the WHO and FAO, and the NOVA system, and advocates for the setting of population dietary targets which are not possible with the use of the NOVA classification. The authors see the latter as too broad, too rigid and too based on processing, as opposed to nutritional quality, to strongly discriminate nutrients such as fat and sugar, rather than just individual foods within each of the four NOVA categories. When micronutrient intakes

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are examined across NOVA food classifications, UPFDs are less micronutrient dense than MP foods. However, the review made the point that studies that examined the sources of micronutrient intake in the United States showed that foods that are enriched or fortified play as important a role in contributing to micronutrient intake as those nutrient dense naturally occurring foods, and that variation in processed food intake does not create nutritional imbalances. It notes that the EPIC study showed that all “highly processed foods” accounted for approximately two-thirds of energy intake and most micronutrient intakes. The reviewers did not agree with claims that UPF are addictive, stating that, “with the exception of caffeine and alcohol, no food or beverage can cause a substance based type of addiction”. The review authors postulate that the combination of increased food portion size and energy density is driving increased energy intake, not food processing. They quote the findings of one study [30] that “although the top ten soft drink companies account for half of global sales, the top ten packaged food companies account for only a small proportion of market share with most individual companies contributing less than 3.3% each” to argue that the popular concept of trans-national food corporations dominating the global food supply is overstated, as is the overall impact of globalisation on diet-related public health issues [26].

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5.3.3. Synthesis of definitions of ‘unhealthy’ food and drinks

5.3.3.1. Definitions of ‘unhealthy’ food and drinks in the peer reviewed reviews

Using our bespoke taxonomy (Table 5), we regrouped the data extraction table for ‘unhealthy’ food and drinks from the peer-reviewed reviews (Appendix 4A) and synthesised this data in Table 8.

Across all the potential action areas of the NOURISHING framework relevant to application of definitions of ‘unhealthy’ food and drinks in the included peer reviewed reviews:

- the most commonly identified broad and sub categories of food classification systems were descriptive synonyms (34%), of which “high in negative nutrient” was the most common (38% of this category), and sugar and sugar sweetened beverages (34%), of which the latter were the most common (56% of this category) (Appendix A4A).
- nutrient profiling systems were mentioned in 10% of reviews; the majority (60%) of these discussed the diversity of different nutrient profiling models applied internationally (Appendix A4A).
- the least commonly identified broad category in the international peer reviews was food-based dietary guidelines using the term ‘discretionary’ foods (6%); however, as seen in Phase One of this project [4], this category was the most common approach used in Australian peer-reviewed literature.

Table 8 synthesises the categories of food classification systems according to any common definition of ‘unhealthy’ food and drinks applied, the source of the definition of the term, the country where it is used, the sector using the term (including any conflict of interest), the potential action areas of the NOURISHING plus framework in which the term has been applied, results of any process, impact or outcome evaluation related to application of the term, any other comments, and reference citations.

Many reviews acknowledged the lack of clarity around the terms for ‘unhealthy’ food and drinks used in the literature, and the lack of consensus around definitions of ‘unhealthy’ food and drinks, particularly for common approaches and terms, such as: “energy-dense, nutrient-poor”; those listing high levels of “negative” nutrients and/or low levels of “positive” nutrients; (apparently arbitrary) lists of foods; “packaged” foods; “ready to eat” meals; and “snacks” (Table 8). A high proportion of reviews focused on definitions of ‘unhealthy’ (sugary) drinks specifically, reflecting recent interest in application of health levies on sugary drinks internationally (Table 8).

There were some difference across sectors, with authors with food industry connections critical of the NOVA framework specifically, and public health groups tending to focus on the great diversity of, and lack of impact and outcome evaluation of, nutrient profiling systems globally (Table 8).

Different categories of food classification systems were used for different policy applications (Table 8).

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Table 8. Summary of definitions and characteristics of 'unhealthy' food and drinks in peer reviewed reviews*

Term and Taxonomy code	Common Definition	Source	Country	Sector/vested interest/COI	Applic-ation	Comment: Evaluation; Health outcome; Strengths; Limitations	References*
UA: Unhealthy foods and/or drinks							
UA1: Nutrient poor, energy dense, low in positive nutrients	**Energy dense, nutrient-poor food and drinks** Empty calories Adam includes 'processed' of 'little or no nutritional value' Garmendia includes 'high in fat, added sugars and sodium' Jensen also specifies SSBs	Usually dietary guidelines or none Glanz and Yarosh 2004 cited for fruit and veg	Internat'l USA Latin America	State none	S U R N O H I	Reviews commonly acknowledge lack of consensus on definitions	Adam 2016 (SR – n) [31] Cawley 2018 (C-n) [32] Jensen 2018 (C – n) [33] Schwartz 2017 (C-n) [27] An 2013 (SR – n) [34] Garmendia 2013 (C-n) [35] Montagnese 2017 (ScR–n) [36]
UA2: High in negative nutrients e.g. high fat, high sugar	**High fat (saturated fat), high sugar, high salt, high energy,** Several include 'low in fibre' too Arno includes 'snacks' specifically Thow adds 'cheap' Pomeranz adds: 'high in sodium, saturated fats, trans fats, cholesterol, added sugars, and refined grains- and SSBs' Strasburger adds 'junk food'	Usually none Thow cites Ni Murchu Johnson cites ADGs Hawley cites Gorton and Ni Mhurchu Starsburger cites Zimmerman 2010	Internat'l Europe USA	State none	N S U H O I- 2 G R I	Comment- Definition lacks clarity; appears arbitrary Thow supports multiple traffic light labels as per UK model	Arno 2016 (MA – n) [37] Cusheri 2016 (SR-n) [38] Eyles 2012 (SR-n) [39] Thow 2014 (SR-y) [40] Foltran 2010 (C-n) [22] Hua 2016 (SR-n) [41] Johnson (2) 2018 (SR-n) [42] Niebylski(1) 2014 (SR-y) [43] Niebylski(2) 2015 (SR-n) [44] Pomeranz 2015 (C-n) [45] Hawley 2013 (SR – n) [46] Strasburger 2011 (PS-n) [47] Kraak 2011 (SR-n) [48] Walker 2010 (SR-n) [49]
UA3: Multiple definitions	**Multiple definitions** across: Ultra-processed; Energy dense, low in dietary fibre, high in sat fat, added sugar, sodium; Perceived to have little nutritional value; Industrial food formulations high in salt, sugar, oils and saturated fats, which include substances not used in culinary preparations, in particular additives used to imitate sensorial qualities of minimally processed foods.	none	Internat'l	Not reported	H U I R O S	None Shangguan: food labelling study. All 60 studies included some process evaluation of nutrition labelling in terms of awareness, acceptance and market uptake only.	Capewell 2018 (C-n) [50] Nortje 2017 (ScR-y) [51] Gittelsohn (2) 2017 (SR-y) [52] Shangguan 2019 (MA-n) [53]

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Table 8. Summary of definitions and characteristics of 'unhealthy' food and drinks in peer reviewed reviews*

Term and Taxonomy code	Common Definition	Source	Country	Sector/vested interest/COI	Applic-ation	Comment: Evaluation; Health outcome; Strengths; Limitations	References*
	Shangguan lists foods & drinks e.g. SSBs, alcoholic beverages, chips, potatoes, white bread, *plus* foods higher in saturated fat, trans fat, added sugars or sodium						
UA4: Food examples	**Provides specific food examples** such as fast foods, SSBs, high fat foods, processed snacks, fried foods, salty snacks Ni Mhurchu adds 'energy dense nutrient poor' Evans adds 'green' and 'red' colour coding Afshin adds energy dense snacks Huang adds 'junk food' mostly defined by product categories e.g. SSBs, candy, cookies, crackers, snacks; few also defined by nutrient cut-off e.g. 'food containing at least 400 mg of salt per serving or 37g of sugar per 100 g serving'	None	Internat'l	State none Afshin: one author has food industry travel, honoraria payments and consulting fees Huang: one author received food industry funding (same as in Afshin paper)	N S U I O R M&S	Comment- Definition lacks clarity and consistency Huang – notes complexities in defining and categorizing 'healthy' or 'unhealthy' food and increased costs associated with subsidizing healthy food. Suggests a category and nutrient-based approach is a feasible option to define healthy and unhealthy food. Ni Mhurchu: definition used to evaluate availability of healthy and unhealthy foods in-store.	Brown 2015 (PS-n) [54] Ni Mhurchu 2013 (Sr-n) [55] Evans 2015 (ScR-n) [56] Afshin 2017 (MA-n) [57] Huang 2018 (ScR-n) [58]
UA5: Inverse of nutritious foods	**Inverse of nutritious foods** *Competitive foods*, often FMNV, include foods which offer less than 5% of the Reference Daily Intake for eight selected nutrients in each serving and include SSBs, commercial foods, vending machines, al a carte venues and school stores (Silden 2018)	Usually none Thow cites Ni Mhurchu	Internat'l	State none	S U R N O H I	Thow and Swinburn (focussing on nutrient profiling in law) define 'unhealthy' as the inverse of ability to carry health claims in Aus and NZ Chriqui: "In most cases, competitive food & beverage policies are associated with changes in consumption and/or availability in the expected direction; however, caution should be exercised, given that nearly all studies were cross-sectional."	Adam 2016 (Sr-n) [31] Arno 2016 (MA-n) [37] Thow 2014 (SR-y) [40] Ni Mhurchu 2013 (SR-n) [55] Chriqui 2014 (SR-n) [59] Silden 2018 (SR-n) [60] Swinburn 2013 (CR-n) [24]
UB: Discretionary							
UB1: Energy dense, nutrient poor	**'Empty-calorie, nutrient-poor'**	none	Internat'l	none	U I	Greiger: "targeting a variety of foods rather than individual foods or nutrients theoretically appears most effective in estimating improvements in nutritional intake, particularly reducing intake of nutrients commonly consumed in excess."	Grieger (1) 2017 (SR-n) [61]
UB2: Reference to ADGs (or other DG) but appears to be	Foods or beverages high in saturated fat, added sugars, or salt, such as crisps, SSBs,	NHMRC ADGs	Internat'l Europe	none Roodenburg: one author is a	I I(2)	Roodenburg: acknowledges lack of consensus on definitions	Greiger (2) 2016 (ScR-n) [62] Johnson (1) 2016 (SR-n) [63]

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Table 8. Summary of definitions and characteristics of 'unhealthy' food and drinks in peer reviewed reviews*

Term and Taxonomy code	Common Definition	Source	Country	Sector/vested interest/COI	Applic-ation	Comment: Evaluation; Health outcome; Strengths; Limitations	References*
non-standard definition	sweet biscuits, cakes and desserts, pastries and processed meats (Greiger) Johnson adds...energy-dense, nutrient-poor foods and beverages. The ADGs recommend limiting the intake of (discretionary) foods containing saturated fat, added sugar, salt and alcohol Roodenburg: Discretionary product groups *do not significantly contribute to the intake of beneficial nutrients*. They are … eaten frequently, are important sources of trans fatty acids, saturated fatty acids, sodium, added sugar and energy, and therefore *targets for product innovation.*	Roodenburg - none		consultant for several food companies	G O N U R M&S	Roodenburg: In summary, the nutrient criteria for logo eligibility developed by the international Choices Programme's global panel of scientists are a transparent, science-based tool designed to encourage both consumers and producers towards a healthier food supply. International applicability makes these nutrient profiles a useful tool to stimulate product innovation and consumer choice globally. This is also true for the fast-changing food markets of developing and transitional countries, including India, Mexico and Brazil.	Roodenburg 2011 (C-y) [23]
UB3: Discretionary calories	**Discretionary calories** are calculated as the difference between the total calories needed based on body size, level of physical activity, and the number of calories consumed in meeting daily nutrient requirements.(Welsh) calories remaining after fulfilling the body's nutrient needs *from the 5 food groups* (Murray)	American Dietary guidelines Position of the Academy of Nutrition and Dietetics: total diet approach to healthy eating. 2013	USA	Not reported	O I(2)	Murray: used to inform future SNAP policy Similar to modelling concepts in ADGs	Murray 2015 (PS-n) [64] Welsh (1) 2011 (C-n) [65]
UC: Processed							
UC1: Ultra-processed **NOVA**	**NOVA** Monteiro: These are formulations mainly or solely of industrial ingredients. Their manufacture involves several stages and various processing techniques and ingredients, many used exclusively by industry. The purpose of processing is to create durable, accessible, convenient and highly palatable ready-to-drink, ready-to-eat or ready-to-heat products. These are typically consumed as snacks or desserts or as pre-prepared dishes and meals that displace natural or minimally processed foods & dishes and meals based on these foods and prepared from scratch. Moodie: Ultra-processed products are *made from processed substances extracted or refined from whole foods* e.g. oils,	Ministry of Health Brazil (2014) Mart´ınez Steele E, Monteiro CA et al. Ultra-processed foods and added sugars in the US diet. BMJ Open 2016 Moodie, R., Monteiro, C., et al (2013). Profits and pandemics: Lancet	Internat'l Brazil	None Gibney paper: Lead author is on food industry committees e.g. Nestle	U I H R I(2)	Gibney: seems to see little advantage from the use of the NOVA classification compared with the current epidemiologic approach, which relies on the linkage of nutrient intakes to chronic disease with subsequent identification of foods that merit consideration in public health nutrition strategies Monteiro: these recommendations are designed to be sustainable personally, culturally, socially, economically and environmentally, and thus fit to face this century. They are for foods, meals and dietary patterns of types that are already established in Brazil, which can be adapted to suit the climate, terrain and customs of all countries.	Gibney 2017 (C-n) [26] Monteiro 2015 (C-n) [66] Capewell 2018 (C-n) [50] Myers 2017 (C-n) [67]

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Table 8. Summary of definitions and characteristics of 'unhealthy' food and drinks in peer reviewed reviews*

Term and Taxonomy code	Common Definition	Source	Country	Sector/vested interest/COI	Applic-ation	Comment: Evaluation; Health outcome; Strengths; Limitations	References*
	hydrogenated oils and fats, starches, variants of sugar, and *cheap parts or remnants of animal foods – with little or no whole foods'*						
UC2: Highly processed/processed but no defn	**Highly processed foods** (ie, energy dense with a high calorie content per weight of food)	none	USA	Yes. Lead author gets food industry funding (Nestle, Dairy Council).	O	Position statement for Council on School Health	Murray 2015 (PS-n) [64]
UC3: Packaged foods	**Typically packaged and often ready to consume** Pinard: pre-packaged foods (commonly *non-perishable and energy-dense, nutrient-poor* foods and beverages)	None Moore et al, 2012. Measuring availability of healthy foods	Internat'l	Not reported None	N U O S R N(2)	Definition lacks clarity (Anand) Anand paper conclusion: the traditional Mediterranean-type diet, including plant foods/ emphasizing plant protein sources, provides a well-tested healthy dietary pattern to reduce CVD.	Anand 2015 (C-n) [68] Pinard 2016 (SR-n) [69]
UC4: Processing not specified (really nutrient density)	**Processed products characterised by excessive amounts of added sugars, fats, and salt as well as low protein and fibre contents**	Popkin, B.M.; et al Global nutrition transition and the pandemic of obesity in developing countries. Nutr. Rev. 2012	Internat'l	none	N	Kliemann paper highlights how food companies are manipulating system re food labelling and serving sizes	Kliemann 2018 (SR-n) [70]
UD: Nutrient profiling							
UD1: Nutrient-poor foods; no cut offs provided	**Nutrient poor foods containing large amounts of sugar, fat, and salt**	none	Latin America	none	N O U	Commentary on policies to address obesity in Latin America	Cominato 2018 (C-n) [71]
UD2: Nutrient cut–offs provided across the 'healthy' continuum; may also apply	**Traffic lights** Lobstein: Red Foods (more than: 20g fat, 5g saturated fat, 12.5g added sugars, 1.5g salt)	Food Standards Agency (2007) Front-of-pack Traffic Light Signpost Labelling	Europe	none	N R M&S	Lobstein: Most nutrient-profiling schemes do not clearly identify less-healthy foods, but are used to attract consumers towards products with supposedly better profiles. The scheme used in the UK to underpin the colour-coded 'traffic light' signalling on food labels, and the one used by the UK broadcasting regulator to limit advertising to children,	Lobstein 2009 (C-n) [11]

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Term and Taxonomy code	Common Definition	Source	Country	Sector/vested interest/COI	Applic-ation	Comment: Evaluation; Health outcome; Strengths; Limitations	References*
system-level cut-points		Technical Guidance.				together represent the most developed use of nutrient profiling in government policy-making, and may have wider utility.	
UD3: Nutrient profiling system, but no details provided	Evans: Red foods high in saturated fats, sugars, or sodium should not be available and include deep-fried foods, *large portions* of cake, and all SSBs	New South Wales policy for school canteens	Internat'l	Not reported	O	Definition lacks clarity- no links to further details in review	Evans 2015 (ScR-n) [56]
UD4: Refers to nutrient profiling system, and healthier vs less healthy foods - range of models	**Directly addressed definitions** Not specifically defined by authors as the purpose of the articles is to describe models that categorise food Nicklas: As opposed to nutrient-dense foods, energy-dense foods (calories/100 g) provide a larger amount of energy in a given amount of food. Rao: ranging from definitions based on single nutrients (e.g. fat or sugar content) to those based on food types or more complex diet patterns. One challenge is that nutrient profiling systems are continuous supporting identification of 'unhealthier' and 'healthier' foods rather than definitions of 'unhealthy' and 'healthy' food and drinks. With the addition of arbitrary system 'cut-offs' colour coding has been used as a proxy for these terms. However, these have generally not been shown to relate to health outcomes.	Various U.S. Department of Health and Human Services, U.S. Department of Agriculture: The Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2005	Internat'l Europe	Not reported Labonte paper: one author jointly funded by Nestle Research Centre Nicklas: symposium paper was developed at was sponsored by the Dairy Council	N O U R S H I(2) M&S	All acknowledges lack of consensus on definitions. Foltran: It has been shown throughout this paper that *nutritional profiles are easy to conceptualize yet difficult to assess quantitatively* Labonte: 78 models; heterogeneous. Models were primarily built for school food standards or guidelines (n=27), food labeling (e.g. front-of-pack; n=12) and restriction of the marketing of food products to children (n=10). *All models consider nutrients to limit, with sodium, saturated fatty acids, and total sugars being included most frequently; and 86% also consider ≥1 nutrient to encourage (e.g. fiber).* No information on validity testing could be identified for 58% of the models. Lobstein: Most nutrient-profiling schemes do not clearly identify less-healthy foods, but are used to attract consumers towards products with supposedly better profiles. These schemes rarely draw attention to foods that should be consumed less frequently: there are no logos to indicate 'eat less of' or 'eat only occasionally' in any scheme. The scheme used in the UK to underpin the colour-coded 'traffic light' signalling on food labels, and the one used by the UK broadcasting regulator to limit advertising to children, together represent the most developed use of nutrient profiling in government policy-making, and may have wider utility. *The principle of defining healthy and unhealthy foods using nutrient profiling has now been formalised and applied in a number of settings and has the potential to be applied in many more.* Swinburn: used a modified version of the UK Food Standards Authority's nutrient profile modelling. Highlights that they have legally defined what is	Foltran, 2010 (C-n) [22] Labonte 2018 (SR-y) [3] Lobstein 2009 (C-n) [11] Swinburn 2013 (C-n) [24] Nicklas 2009 (C-n) [25] Rao 2013 (MA-y) [72]

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Table 8. Summary of definitions and characteristics of 'unhealthy' food and drinks in peer reviewed reviews*

Term and Taxonomy code	Common Definition	Source	Country	Sector/vested interest/COI	Applic-ation	Comment: Evaluation; Health outcome; Strengths; Limitations	References*
						considered an unhealthy food thus codifying the 'good food/bad food' dichotomy that the food industry has been arguing against for years Nicklas: The concept of selecting foods that are nutrient dense to help meet nutrient needs within calorie limits is supported by the 2005 DGA, health professionals, and nutrition organizations. *Establishing a standardized definition of nutrient density that is relevant to consumers and practical for making better food choices would help Americans build healthier diets.* Many new research questions and considerations have been raised since the introduction of a number of nutrient-profiling systems, further supporting the need for a unified definition of nutrient density. Rao: Food price study. Findings demonstrate that, for certain metrics of healthfulness, the selected unit of comparison alters the results. In particular, metrics based on fat content demonstrated greater price differences per calorie than per serving. The most striking example was for dairy foods: healthier options were $0.004 less expensive per serving but $0.21 more expensive per 200 kcal. On average, *healthier* food-based diet patterns were more expensive than *less healthy* patterns, whether based on an actual day's intake or per 2000 kcal. Our results indicate that lowering the price of healthier diet patterns- on average ~$1.50/day more expensive- should be a goal of public health and policy efforts, and studies suggest that this intervention can reduce consumption of unhealthy foods.	
UE: Other - food habit focus							
UE1: Fast food	**Fast food.** Characteristic qualities of fast foods include large portion size, high energy density, high content of saturated and trans fats, high glycaemic load, low content of fibre, and palatability (appealing to primordial taste preferences for fats, sugar, and salt)	None	Internat'l	COI not available – link broken	N(2)	None provided	Agostoni 2011 (C-n) [73]
E2: Out-of-home eating	McGuffin: any food, or beverage that has been *cooked outside the family home* for a *family to eat together*. This, therefore,	None	Internat'l	none	S O	Definition used to frame scope of systematic review on prepared food sources	McGuffin 2013 (SR-n) [74]

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(may be healthy?)	incorporates takeaways but *not ready meals* purchased in a supermarket.				M&S		
UE3: Ready-to-eat meals (may be healthy?)	Gittlesohn: ready-to-eat foods that can be *eaten outside the home* or *brought back or delivered to the home to eat* Hillier-Brown: as per Gittlesohn and adds *or to be delivered*. However, a packet of crisps and a drink would not be considered a ready-to-eat meal, even if the person consuming them was doing so in replacement of a meal.	none	USA Internat'l	none	N S I(2)	Hillier-Brown: Acknowledges lack of consensus on definitions	Gittelsohn (1) 2013 (SR-n) [75] Hillier-Brown 2017 (SR-n) [76]
UE4: Snacks	**Snacks** served are typically characterized as *low in nutrient density,* with over three-quarters of the snacks served containing added sugars (e.g. cookies) or categorized as salty snacks e.g. crisps Hess: refers to eating foods or consuming caloric beverages *between regular meals*. "Snack foods" will designate *energy-dense, nutrient-poor* foods high in sodium, sugar, and/or fat such as cookies, cakes, sugar-sweetened beverages, and chips	Reedy J & Krebs-Smith SM (2010) Dietary sources of energy, solid fats, and added sugars among children and adolescents in the United States. J Am Diet Assoc Lipoeto NI et al. Food consumption patterns and nutrition transition in South-East Asia. Public Health Nutr 2013	USA Internat'l	None COI not available for Agostini – link broken	O H I I(2) N(2)	Pomeranz: Acknowledges lack of consensus on definitions Beets: Reviewed policies for snacks served in after school programs: Consistently, policies endorsed serving fruits/vegetables, whole grains and milk/dairy products, and limiting foods high in fats/sugar/energy (calories). Two policies focused predominantly on total energy and macronutrient composition of snacks, a single policy suggested limits on sugar sweetened beverages, and three endorsed serving water daily. Hess (2): Snacks, snacking, and snack foods are difficult to define and study. The definition of and motivation to snack depend on external factors such as the time of day, type of food, food availability, and location, among others.	Beets 2011 (SR-y) [77] Hess (2) 2016 (ScR-y) [28] Pomeranz 2015 (C-n) [45] Agostini 2011 (C-n) [73]a
UF: Other – sugar and sugar-sweetened beverages (SSBs)							
UF1: Added Sugars	**Sugars and syrups that are added to foods during processing, preparation, or at the table.** Montagnese: added sugars (e.g. soft drinks, fruit drinks, sweetened coffee and tea, energy drinks, alcoholic beverages, & flavored waters) Moore: Syrups and other caloric sweeteners used as a sweetener in other food products. *Naturally occurring sugars such as those in fruit or milk are not added sugars*'	US Food and Drug Administration [FDA]. 2014b Dietary Guidelines for Americans 2015-2020. none	Internat'l USA	None Goldfein: employed at General Mills Not reported	U N I I(2)	Goldfein: commentary Goldfein: Labelling "added sugars" will have its challenges in the food industry, and it is not clear that it will benefit the consumer either. The scientific evidence linking added sugars intake to obesity and other diseases is neither complete nor perfect. Overall, public health recommendations about "added sugars" must be balanced with the reality that sugar added to food is an important piece in the food science puzzle given its several functionalities in food.	Bes-Restrollo 2016 (SR-n) [78] Goldfein 2015 (C-y) [79] Hess (1) 2012 (ScR-y) [28] Montagnese 2017 (ScR-n) [36] Moore 2016 (C-n) [80] Palou 2009 (C-n) [81] Welsh (1) 2011 (C-n) [65]

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Term and Taxonomy code	Common Definition	Source	Country	Sector/vested interest/COI	Applic-ation	Comment: Evaluation; Health outcome; Strengths; Limitations	References*
	Palou adds: sucrose, fructose, glucose, starch hydrolysates and other isolated sugar preparations					Hess: article focuses on the methodological and political process of defining sugars and foods containing sugars; the article includes definitions used in a range of policies. Concludes that consumers can be left confused about the role of added sugars in the diet Moore: authors summary of definitions used in dietary guidelines Montagnese: Food based DGs from 30 countries in the Americas were collected, Of these FBDGs, 93% adopted a food guide that conveys local traditions and classifies foods into six or seven groups. Main food groups are vegetables, fruits, cereals, starchy vegetables and fruits, legumes, milk and dairy, protein-rich foods, oils and fats, and sugar and sweeteners. Some differences include single food classifications. The main nutritional points are similar: (1) Consume large amounts of fruits, vegetables, and cereals; and (2) limit intake of fat, simple sugars, and salt. Although there is general agreement on the basic nutritional messages, FBDGs remain insufficient regarding food groups and the identification of subgroup population nutritional requirements, particularly in countries where both excess and deficit malnutrition are present.	
UF2: Free sugars	Monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups fruit juices and juice concentrates' Under this definition, lactose when naturally present in milk and milk products is excluded. Gibson adds: Excluded from free sugars: Sugars in fresh, frozen, stewed, canned and dried fruit and vegetables; Milk sugar (lactose) naturally present in milk and dairy products; Sugars naturally present in small amounts in cereal grains, nuts and seeds unless consumed as a drink.	FAO/WHO scientific update on carbohydrates in human nutrition: introduction Public Health England, *personal communication*	Internat'l UK	None Gibson: grant from Sugar Nutrition + Sweeteners Assoc and Sweetener companies	I(2) N I	Commentaries Gibson acknowledges lack of consensus on definitions Gibson: Labelling of free sugars would extend choice and encourage reformulation; however, government needs to assist industry by addressing current analytical and regulatory problems.	Bes-Restrollo 2016 (SR-n) [78] Moore 2016 (C-n) [80] Gibson 2017 (C-n) [82] Palou 2009 (C-n) [81] Myers 2017 (C-n) [67]
UF3: High sugar foods	Author used term '**high sugar foods'** to reflect the diversity of the outcome measures in the literature, the nature of sugar	none	Internat'l	None	U	Included studies: the impact of fiscal measures on differing categories of foods, grouped by criteria that include high sugar content; where food categories	Roberts 2017 (RR-n) [83]

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Term and Taxonomy code	Common Definition	Source	Country	Sector/vested interest/COI	Applic-ation	Comment: Evaluation; Health outcome; Strengths; Limitations	References*
	consumption in the diets of individuals and the aims of the R/V.					were based on established 'cut-offs' or where foods typically high in sugar (e.g. confectionery) were categorised and examined against foods low in sugar (e.g, vegetables). Relevant studies examining SSBs as an outcome were included.	
UF4: SSBs including energy drinks & fruit juice	Bergallo: SSBs which combine high caloric content and minimal nutritional value Buhler: Soda sweetened with sugar, corn syrup or other caloric sweeteners and other [sweetened] carbonated and uncarbonated drinks such as sports and energy drinks Agostini: any sugar-sweetened or *artificially sweetened* fruit flavoured drinks, sports (natural or artificial) drinks, and *drinks that contain 100% fruit juice*; *caffeinated or decaffeinated tea or coffee* Huang adds: calorie/sugar content cut-points (e.g. ≥ 2 cal per oz. or ≥ 5 g of added sugar per 12 oz). Imamura & Jenson add: *not* presented *as diet or non-caloric beverages*. Lane adds: are a top energy source for children and adolescents. Powell & Jenson add: any beverage *with added sugar* e.g. fruit drinks (*non-100% fruit juice*) Cominato adds all beverages with added sugar, *excluding dairy and yogurt* Al-Shaar: Energy drinks are non-alcoholic beverages marketed to improve energy, stamina, athletic performance, and concentration	None Brownell KD, Frieden TR. Ounces of prevention the public policy case for taxes on sugared beverages. N Engl J Med 2009 Fiorito LM, Marini M, Francis LA, et al. Beverage intake of girls at age 5 y predicts adiposity and weight status in childhood and adolescence. Am J Clin Nutr 2009 Popkin BM, Nielsen SJ. 2003. The sweetening of the world's diet. Obes. Res. Institute of Medicine. Accelerating progress in obesity prevention: solving the weight of the nation. 2012	Latin America Canada USA Internat'l	None Agostini: CoI not available – link broken Huang: one author funding from Avocado board + pharma co's Welsh: one author on board of Dunkin Brands (Dunkin Donuts)	N O U R I S I(2) N(2) G	Bergallo: Definition lacks clarity Agostini: Re childhood obesity, no single nutrient has been unequivocally associated with the development of overweight and obesity. With respect to obesity prevention, no recommendations on fat quantity and quality, protein or amino acid intake, or calcium and dairy product intake can be made. Huang: These findings highlight recent action on dietary policies to improve cardiometabolic health in the US. Considering growing nutritional science and the relevance of other (beneficial, harmful) foods and overall dietary patterns for health, the lack of focus on other foods (other than fruit and vegetables, and SSBs) is striking. Nuts/seeds, whole grains, seafood, and plant-based oils (rich in polyunsaturated fats) are each strongly and independently associated with cardiometabolic benefits, and processed foods (e.g. processed meats) high in sodium, added sugar, and low in fiber and healthy fats are linked to harm. *This could be partly attributed to complexities in defining and categorizing healthy or unhealthy food and increased costs associated with subsidizing healthy food* [163]. *A category- and nutrient-based approach is a feasible option to define healthy and unhealthy food* [45]. Malik notes for SSBs there are slight differences in definitions due to heterogeneity in assessment methods. Scharf notes Although some studies have reported juice consumption alongside that of SSBs, most studies—as well as this review—consider SSBs separately from juice. Van Buul notes based on a review of the literature, we demonstrate that fructose, as commonly consumed in mixed carbohydrate sources, does not exert specific metabolic effects that can account for an increase in body weight. Consequently, public	Bergallo 2018 (SR-y) [84]b Buhler 2013 (PS –n) [85] Grummon 2018 (SR –y) [86] Agostini 2011 (C-n) [73] Huang 2018 (ScR-n) [58] Imamura 2015 (MA-n) [87] Lane 2016 (SR-n) [88] Malik 2015 (C-n) [89] Nakhimovsky 2016 (SR-y) [90] Powell 2013 (SR-y) [91] Scharf 2016 (C-n) [92] Van Buul 2014 (C-n) [93] Vercammen 2018 (SR-y) [94] Cominato 2018 (C-n) [71] Pomeranz 2015 (C-n) [45] Jensen 2018 (C-n) [33] Welsh (2) 2013 (C-n) [95] Al-Shaar 2017 (ScR-n) [96]

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Term and Taxonomy code	**Common Definition**	**Source**	**Country**	**Sector/vested interest/COI**	**Applic-ation**	**Comment: Evaluation; Health outcome; Strengths; Limitations**	**References***
						health recommendations and policies aiming at reducing fructose consumption only, without additional diet and lifestyle targets, would be disputable and impractical.	
UF5: artificially sweetened beverages	Artificially sweetened beverages included low caloric soft drinks	none	Internat'l	none	I		Imamura 2015 (MA-n) [87]

* Key for references column: SR = systematic review; MA = meta-analysis; C = commentary; ScR = scoping review; PS = position statement

Y = yes, definition of healthy/unhealthy terms from original papers extracted in review's summary table/s; N = no, definition of healthy/unhealthy terms not from original papers extracted in review's summary table/s

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5.3.3.2. Definitions of 'unhealthy' food and drinks in websites

Using our bespoke taxonomy (Table 5), we regrouped the data extraction table for 'unhealthy' food and drinks in the international and national websites (Appendixes 4B and 4C) and synthesised this data in Table 9.

Across all the potential action areas of the NOURISHING Framework relevant to application of definitions of 'unhealthy' food and drinks provided in included international websites:

- the most commonly identified broad and sub categories of food classification systems were descriptive synonyms (54%), of which the majority (58%) focused on negative nutrients (Appendix 4B)
- a high proportion of international websites (27%) focused on sugar and sugar sweetened drinks
- few (4%) used nutrient profiling systems to identify 'unhealthy' food.

Across all the potential action areas of the NOURISHING framework relevant to application of definitions of 'unhealthy' food and drinks provided in included national websites:

- the five most commonly identified broad and sub categories of food classification systems were nutrient profiling systems (26%), of which the majority (86%) proposed specific models that incorporated nutrient cut-offs across the 'healthy' spectrum and/or system-level cut-points to differentiate 'unhealthy' food and drinks (Appendix 4C). This was in marked contrast to the peer-reviewed reviews for which the majority (greater than 60%) highlighted the range of potential models available (section 5.3.3.1)
- about a quarter of all national websites used degree of food processing to define 'unhealthy' food and drinks; however this concept was relatively infrequently used (4%) in the included international websites (Appendices 4B and 4C)
- references to food-based dietary guidelines to define 'unhealthy' food and drinks were found in 21% of national websites; most of these definitions (87%) mentioned these foods were high in negative nutrients (Appendix 4C)
- only Australian websites used the term 'discretionary' to indicate 'unhealthy' food and drinks [4].

Table 9 synthesises the categories of food classification systems in the websites consistent with the taxonomy outlined in Table 5, according to any common definition of 'unhealthy' food and drinks applied, the source of the definition of the term, the country where it is used, the potential action areas of the NOURISHING (plus) framework in which the term has been applied, results of any process, impact or outcome evaluation related to application of the term, any other comments, and website sources. No websites included any information about potential conflict of interest, so this field was removed from the summary table (Table 9).

No websites acknowledged the lack of clarity around the terms for 'unhealthy' food and drinks applied nor the lack of consensus around definitions of 'unhealthy' food and drinks. Neither did any website present information about the whether the term 'unhealthy' was applied in a relative (i.e. meaning "less healthy" or "unhealthier") rather than in an absolute way. The national websites tended to be more focused on particular applications of food classification systems than the peer-reviewed reviews; these applications included food-labelling, reformulation, healthy food procurement strategies (especially in schools) and, to a lesser extent, communication and education initiatives (Table 8; Table 9). Descriptive synonyms, including publication of specific food lists, and nutrient profiling systems are dominant on national websites, with some notable country differences, such as the NOVA system based on degree of food processing in Brazil, the application of warning signs in Chile (Table 9) and 'discretionary' food and drinks in Australia [4].

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As in the peer-reviewed reviews, different categories of food classification systems tended to be used for different policy applications (Table 9). The evaluations included on the websites tend to report at the level of process evaluation (such as reach, acceptance and uptake of the policy action) or, less frequently, at the level of impact of the policy action, such as change in purchasing habits following introduction of a sugary drinks tax, rather than focus on any evaluation of the food classification system applied during the process (Table 9). The websites appeared to assume that reduced consumption of 'unhealthy' or 'less healthy' foods, however they were defined, would lead to health benefits. However, this assumption has rarely been tested in the literature, especially for 'less healthy' foods (Table 8).

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Table 9. Summary of definitions and characteristics of 'unhealthy' food and drinks in international and national websites

Term and Taxonomy code	Common definition	Source	Country	Appli-cation	Comments; Evaluation; Health outcome; Strengths; Limitations	References
UA. Unhealthy foods and/or drinks						
UA1: Nutrient-poor and/or energy-dense	Energy-dense and nutrient poor foods (Korea) "food of minimum nutritional value" (Maine, USA)	None	South Korea USA (Maine)	O R	South Korea legislation prohibits sale of sugary drinks and "other energy-dense and nutrient poor foods" in schools Maine: Evaluated application compliance in schools Polacsek M et al. (2012) Public Health Reports 127(2), 216-223	Ref to South Korean legislation (NOURISHING database) Ref to Maine's law (2007) prohibiting advertising of certain unhealthy food on school grounds (NOURISHING database)
UA2: High in negative nutrients e.g. high fat, high sugar	**INTERNATIONAL WEBSITES** Foods high in fat [INFORMAS and WCRF specify saturated fats and trans fats), salt or sugar [WCRF specifies "free sugars"] [1] NICE: "(as determined by the Food Standards Agency's nutrient profile)" links to UD3 CDC: foods and drinks with added sugar, fat and sodium … INFORMAS: adds energy-density and "in large portion sizes" WCRF: adds "high in energy"	None Ref INFORMAS papers	Intern'l	R N O S I I (2) M&S	CDC focus is on increasing availability of healthy foods in the environment Various INFORMAS definitions used to describe food environments related to NCDs (food composition; diet quality etc) WHO (2011) and WHO (2014) = foods high in fat, sugar or salt cf WHO (2018) = "limit energy intake from total fats and sugars" WCRF media release promotes its support of World Health Organization (Europe) nutrient profile model.	NICE guidelines 2010 (CVD prevention) US CDC 2019 (Healthy food environments) INFORMAS (various) WHO 2018 (O & O) WHO 2011, 2014, 2015 (Marketing to children)
	NATIONAL WEBSITES Food high in fat, salt and sugar, as well as low-quality reformed or reconstituted food (UK) foods that are rich in fats (Hungary) "red category foods": foods and drinks are of poor nutritional value and high in saturated fat, added sugar and/ or added salt and energy. They can easily contribute to consuming excess energy. These are often highly processed foods and drinks. [2]	[1] National Dietary Guidelines [2] NZ national dietary guidelines	UK Hungary NZ	O	UK: mandatory nutritional standards for all food served in state schools – Evaluation of application (Spence S et al. (2014); Adamson A et al. (2013); Spence et al (2013) – details in spreadsheet) NZ: Evaluation of application "mentioned on webpage"	UK Nutritional Requirements for Food and Drink in Schools Regulations 2008 (NOURISHING database) UK Dept of Health and Social Care 2019 (School food standards) Hungarian school food policy (NOURISHING database) NZ Ministry of Health 2016 (National Healthy Food and Drink Policy)
UA3: Multiple definitions	Brazil: drinks of low nutritional value, canned meats, confectionary, processed food with a sodium and/or saturated fat content higher than a specified threshold. South Korea: cookies/candies/popsicles, breads, chocolates, dairy products, sausage, some beverages, instant noodles and fast food (seaweed rolls, hamburgers, sandwiches). Three permitted designs for front-of-pack labelling using green, amber and red to	None	Brazil South Korea US states/cities	O R U S	Brazil – foods prohibited under Resolution no. 38 (16 July 2009) which sets food and nutrition-based standards for the food available in the national school meal programme. South Korean Special Act on Safety Control of Children's Dietary Life recommends	Brazilian Ministry of Education (NOURISHING database) South Korean regulation 2011 (NOURISHING database) WCRF (source unclear) (NOURISHING database)

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Table 9. Summary of definitions and characteristics of 'unhealthy' food and drinks in international and national websites

Term and Taxonomy code	Common definition	Source	Country	Appli-cation	Comments; Evaluation; Health outcome; Strengths; Limitations	References
	identify whether products contain low, medium or high levels of negative nutrients WCRF: food with high caloric density, defined as equal to or more than 275 calories per 100g. Includes chips and snacks, confectionery, chocolate and cacao based products, puddings, peanut and hazelnut butters. New York USA: maximum/minimum levels nutrients per serving; standards on specific food items (e.g. only no-fat or 1% milk); portion size; water to be offered with food; prohibition on deep-frying Massachusetts USA: ban on trans fat and deep-frying, maximum levels sodium in food and calories in beverages Navajo Nation, USA: "minimal-to-no-nutritional value food items", including sugar-sweetened beverages, pre-packaged and non-pre-packaged snacks stripped of essential nutrients and high in salt, saturated fat and sugar including sweets, chips and crisps				colour coded labelling for use on the front of pre-packaged children's "favourite food" NY: Application evaluation: Lederer A et al. (2014) Toward a Healthier City: Nutrition Standards for New York City Government. American Journal of Preventive Medicine 46(4): 423-428.2	New York City's Food Standards 2014 (NOURISHING database) Massachusetts State Agency Food Standards 2009 (NOURISHING database) Navajo Nation Healthy Diné Nation Act 2014 (NOURISHING database)
UA4: Food examples	**INTERNATIONAL WEBSITES** Avoid fried food; drinks; confectionery; high in added sugars (cakes, pastries and SSBs); other food high in fat and sugar (such as some take-away and fast foods) (NICE 2011) NICE (2015) also adds "energy dense food and drinks" and drinks made with full fat milk or cream SIGN: including foods containing animal fats, other high fat foods, confectionery and SSBs US CDC: lists examples to limit incl foods with added sugars (e.g. candy, cakes, cookies, and ice cream) foods high in salt (e.g. canned foods, processed meats, some frozen dinners, some snack foods). WCRF: (deep) fried food, sweet treats and SSBs	None USA cites CDC	International US	I N(2) I(2)	WCRF: definition used in description of school food regulation policy: "Flanders (2008) and Wallonia (2013) both have voluntary guidelines with food-based standards for food available in schools, including restrictions on (deep) fried food, sweet treats and soft drinks"	NICE guidelines 2011 (Type 2 diabetes prevention) NICE guidelines 2015 (Preventing excess weight gain) SIGN guidelines 2010 (Management of Obesity) SIGN guidelines 2010 (Management of Obesity: Quick Reference Guide [for clinicians]) US CDC 2018 (Foods and Drinks for 6 to 24 Month Olds) WCRF 2019 (NOURISHING database)
	NATIONAL WEBSITES Fried products, sweet treats, crisps and savoury (Austria) List of food not recommended [no further detail available in English (Slovenia)	None	Austria Slovenia French Polynesia Ireland	O U I R	Slovenia: Application evaluation - Gregorič M et al. (2015) School nutrition guidelines: overview of the implementation and evaluation. Public Health Nutrition 18(9), 1582-1592	Austrian Ministry of Health "Our School Buffet" program (NOURISHING database) Slovenia's Law on School Nutrition 2010 (NOURISHING database)

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	Sweetened drinks and beer, confectionary, ice cream (French Polynesia) Jam, marmalade and honey; sugar; confectionary (crisps, chocolate, cakes and biscuits); fried and other high fat food products (Ireland) Ice cream, pastries and sweets (Sweden) "food and beverages that are not recommended for excessive consumption in general diets" (Turkey) "foods of minimal nutritional value": soda water, water ices, chewing gum, certain candies (US1) "SNAP-declared Accessory foods": list of snack and dessert food items (definition used to inform industry about eligibility to act as a SNAP retailer) (US2) "SNAP-prohibited foods": Beer, wine, liquor, cigarettes, tobacco; vitamins, medicines, supplements; live animals (some exceptions e.g. fish); Prepared foods for immediate consumption; hot foods; non-food items (US3)		Sweden Turkey USA	S	French Polynesia: specific products that are subject to tax/excise duty Ireland: school food regulation policy specifically prohibits or restricts foods e.g. SNAP – Implementation evaluation: https://www.fns.usda.gov/resources?f%5B0%5D=program%3A2&f%5B1%5D=resource_type%3A2	Description of French Polynesia's food and beverage taxes (NOURISHING database) Irish Health Dept 2017 (Nutrition Standards for School Meals) Turkish Govt regulations restricting advertising 2018 (NOURISHING database)Swedish Good School Meals guidelines 2013 (NOURISHING database) US1. Dept of Agriculture 2013 (School Breakfast Program) US2 Department of Agriculture, Food and Nutrition Services 2018 (What are Staple Foods?) US3 Department of Agriculture, Food and Nutrition Services 2013 (What Can SNAP Buy?)
UA5: Inverse of "nutritious" or 'healthy' e.g. "competitive"	**INTERNATIONAL WEBSITES** CDC: foods and drinks with added sugar, fat and sodium *that can be purchased outside the school lunch program*	None	Internat'l	S O		US CDC 2019 (Healthy food environments)
	NATIONAL WEBSITES "non-recommended food and beverages": Increase the consumption of starchy foods, including cereals (especially whole grain cereals, which provide fibre), potatoes, pulses, etc. They should be present at each meal (France)		France	U N I R		French Dept of Health 2019 (Health through diet [National Priority Prevention Plan])
UB. Discretionary	*None in this category*					
UC. Processed						
UC1: Ultra-processed/NOVA classification	Food which is mainly produced from substances extracted from whole food and/or food components derived from materials synthesised from organic matter, and which contains ≥1mg of sodium per 1kcal, ≥10% of total energy from free sugars, ≥30% of total	None	Brazil	H	Brazil 2 – adds to definition: As a result of their formulation and presentation, they tend to be consumed in excess, and displace natural or minimally processed foods. Their means of production, distribution, marketing,	Brazil 1: Ministry of Health of Brazil procurement guidelines for food served or sold within the Ministry's facilities and in its

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	energy from total fat, ≥10% of total energy from saturated fat and ≥1% of total energy from trans fat (in alignment with PAHO's Nutrient Profile Model). (Brazil 1) Because of their ingredients, ultra-processed foods such as salty fatty packaged snacks, soft drinks, sweetened breakfast cereals, and instant noodles, are nutritionally unbalanced. (Brazil 2)				and consumption damage culture, social life, and the environment.	entities 2016 (NOURISHING database) Brazil 2: Ministry of Health of Brazil website
UC2: Highly processed or processed but no definition provided	food high in fat, salt and sugar, as well as low-quality reformed or reconstituted food (UK) "processed": ingredients and methods used in the manufacture of processed foods – such as vegetables in brine, fruits in syrup, cheeses and breads – unfavourably alter the nutritional composition of the foods from which they are derived. (Brazil 1, 2) "highly processed": processed or prepared foods and beverages that contribute to excess sodium, free sugars, or saturated fat. (Canada) "processed foods and beverages": products that are canned, cooked, frozen, dried or otherwise processed to extend preservation, food safety, and quality in transportation, distribution and storage. (Canada) "highly processed": foods [that] tend to be high in kilojoules, added fat, sugar and/or salt but low in vitamins, minerals and fibre. Highly processed foods include sweets, sugary drinks, biscuits, muesli bars, cakes, pastries, pies, instant noodles, salami, luncheon, chippies and store-bought burgers and pizzas. (NZ)	None	UK Brazil Canada NZ	O H I(2)	UK: mandatory nutritional standards for all food served in state schools. Implementation evaluated (Spence S et al. (2014); Adamson A et al. (2013); Spence et al (2013) – details in spreadsheet)	UK Nutritional Requirements for Food and Drink in Schools Regulations 2008 (NOURISHING database) Brazil 1: Ministry of Health of Brazil procurement guidelines for food served or sold within the Ministry's facilities and in its entities 2016 (NOURISHING database) Brazil 2: Ministry of Health of Brazil website Health Canada 2019 (Canada's dietary guidelines: for Health Professionals and Policy Makers) NZ Health Department 2017 (Making healthier food choices)
UC3: Packaged foods	None					
UC4: Processing not specified (really nutrient density)	**INTERNATIONAL WEBSITES** Processed energy-dense foods that are high in saturated fats, trans fats, sugars, and salt	None	Int	I I(2)		WHO 2016 (Salt reduction)
	NATIONAL WEBSITES Nutritional standards for pre-packaged food include: 25 calories per 12 ounces are permitted in vending	None	USA (San Francisco)	O		San Francisco's Healthy Vending Machine Policy (NOURISHING database)

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	machines, with the following exemptions: 100% fruit juice with no added sugars or sweeteners					
UD. Nutrient profiling						
UD1: Nutrient-poor foods; no mention of profiling system or cut offs provided	None					
UD2: Nutrient cut–offs provided across the 'healthy' continuum; may also apply system-level cut-points	**INTERNATIONAL WEBSITES** CDC: Unhealthy snacks/"Red whoa": >250 calories per portion as packaged; >15% of total calories from saturated fat; >0 g of trans fat; >35% of calories from total sugars; >600 mg sodium (Na)/serving	Saelens et al 2007: restaurants and vending (NEMS-R)	Intern'l	O S		US CDC 2015 (A Toolkit for Creating Healthy Hospital Environments: Making Healthier Food, Beverage, and Physical Activity Choices)
	NATIONAL WEBSITES category-based thresholds on sodium, saturated fat and total sugar [for restricting marketing to children] (EU) defined nutritional criteria for foods to restrict marketing (WHO Eu) food and non-alcoholic drinks that are high in fat, sugar and salt, as defined by a Nutrient Profiling Model (UK(a)[2], UK(b), Ireland) guideline limits for salt, sugar and fat content in 10 food categories (Denmark) "red category foods": products containing high levels of energy, fat, saturated fat, salt and sugar (UK(c) [2]) Canada: proposed focus on sodium (salt), sugars, and saturated fat, with two "threshold" options for the level of restriction based on Daily Values of ~5% and 15% Chile: define limits for calories (275 calories/100g or 70 calories/100ml), saturated fat (4g/100g or 3g/100ml), sugar (10g/100g or 5g/100ml) and sodium (400mg/100g or 100mg/100ml) content considered "high" in food and beverages	None Specific country school guidelines [Refs in spreadsheet] [2] UK FSA	Brazil Canada Chile Denmark EU Finland France Ireland Mexico Portugal Spain Switzerland UK USA (New York)	R O N (most) H (Brazil)	EU Pledge: re advertising restrictions to children Canada: definition proposed during consultation to inform ban on marketing of unhealthy products Chile: Limits defined under regulation in 2015. All food that exceeds limits will have a front-of-package black and white warning message inside a stop sign that reads "HIGH IN" followed by CALORIES, SATURATED FAT, CALORIES or SUGAR OR SODIUM, as well as "Ministry of Health". A warning message will be added to products per category that exceeds the limit (e.g. a product high in fat and sugar will have two stop signs). The regulatory norms provide specifications for the size, font and placement of the warning message on products. Limits were implemented using an incremental approach, reaching the defined limits by 1 July 2018. The law also prohibits	EU Pledge 2007 (NOURISHING database) WHO Regional Office for Europe 2018 (Marketing and advertising) Health Canada 2017 (Consultation Report: Restricting Marketing of Unhealthy Food and Beverages to Children in Canada) Chilean Govt legislation (NOURISHING database) Danish Forum of Responsible Food Marketing Communication 2008 (NOURISHING database) Ireland: Irish Minister for Health Promotion, media release 2018 (NOURISHING database) Ref to Irish Nutrient Profiling Model and restrictions on advertising of food and non-

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	Mexico – ref to foods that comply/do not comply with "nutritional criteria" but unclear ("limit the availability of other soft drinks, whole milk, salty and sweet snacks, and desserts that comply with nutritional criteria to a maximum of two days per week; and prohibit completely products that do not comply with the nutritional criteria") Mexico (2) – "sweetened drinks, potato chips, chocolates and confectionary and was expected to be extended to other food covered by the nutrient profiling model" Portugal (1): Energy value of more than 250 kcal per food product per serving. High quantity of sugar (more than 16 g of sugar per 100g and 7g of sugar per 100 ml) (excluding sugar naturally present in fruit, vegetables and dairy products). Lipid content greater than 30-35% of the total energy value, or greater than 10g per 100g. Content of saturated fatty acids greater than 10% of the total energy value and of trans fatty acids higher than 2g per 100g of fat. Salt content higher than 0.9g per 100g of food/drink. [1] Portugal (2): Banned products include salted products, cakes and pastry, breads with sweet fillings, delicatessen items, sandwiches with sauces, biscuits and cookies with more than 20g of sugar and/or with more than 20g of fat, soft drinks, sweets, sweet desserts, quick meals such as hamburgers or pizzas, alcoholic beverages, chocolates in portions with more than 50 grams and "snacks" defined as maize strips, chips, sweet or salty popcorn. Spain: food and beverages high in saturated fat, trans fat, salt and sugar [determined using nutritional criteria outlined in the 2010 Consensus document on food in education centres] Brazil: Ultra-processed: food … contains ≥1mg of sodium per 1kcal, ≥10% of total energy from free sugars, ≥30% of total energy from total fat, ≥10% of				the sale of these "high in" food items and beverages in schools. Denmark: voluntary code recommends food products exceeding limits should not be marketed to children Spain: Law on Nutrition and Food Safety (2011) prevents kindergartens and schools from selling food and beverages high in saturated fat, trans fat, salt and sugar [per nutritional criteria]. UK labelling application evaluated Sacks et al (2009) Impact of front-of-pack 'traffic-light' nutrition labelling on consumer food purchases in the UK. Health Promotion International 24(4), 344-352	alcoholic drinks (NOURISHING database) Mexico (1): Govt's mandatory food and beverage guidelines for schools (updated 2014) (NOURISHING database) Mexico (2): advertising restrictions 2015 (NOURISHING database) Portugal (1): Directorate-General for Health 2017 (Food in the Institutions of the Ministry of Health) Portugal (2): bans on sale of food/drinks at Ministry of Health and National Health Service institutions (NOURISHING database) Spain: Law on Nutrition and Food Safety 2011 (NOURISHING database) UK(a): Dept of Health and Social Care 2018 (Childhood obesity: a plan for action) UK(b): Ref to UK advertising code (NOURISHING database) UK(c): Ref to FSA labelling scheme (NOURISHING database) Ministry of Health of Brazil procurement guidelines for food served or sold within the Ministry's facilities and in its entities 2016 (NOURISHING database) Description of Belgian Government's adoption of the NutriScore labelling system 2019 (NOURISHING database) Description of French Ministry of Health's nutrition labelling scheme (NOURISHING database)

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Term and Taxonomy code	Common definition	Source	Country	Appli-cation	Comments; Evaluation; Health outcome; Strengths; Limitations	References
	total energy from saturated fat and ≥1% of total energy from trans fat (in alignment with PAHO's Nutrient Profile Model). **[NutriScore system]** "dark orange (E) foods": [Foods that should be limited, as classified by the NutriScore label using a nutrient-profiling system, based on the UK Food Standards Agency model] Based on a scale of 5 colours: dark green to dark orange. The score takes into account per 100 grams whether the contents of the product include nutrients and food that should be favoured (including fiber, protein, fruit and vegetables) or nutrients that should be limited (including energy, saturated fatty acids, sugars and salt). The amount of nutrients per 100 grams contained in the product is scored using a points system (0–40 for nutrients that should be limited and 0–15 for nutrients that should be favoured). (Belgium, France, Switzerland) **[Sodium only]** Products are required to carry a "high salt content" warning if the salt content is more than 1.1% in bread, 2% in sausages, 2.2% in cold meat cuts, 2% in fish products, 1.4% in cheese, 1.2% in ready to eat meals, and 1.4% in breakfast cereals or crisp bread. Limits also apply to unpackaged cheese, sausages, and other meat products, where the information must be communicated in writing at the retail outlet in a readily accessible manner close to the unpacked food. (Finland) dishes contain 2,300mg of sodium or more (New York)					Swiss Food Safety and Veterinary Office 2019 (Healthy food choices) Ref to Finnish Govt legislation (1993) mandating use of warning labels on high-salt food (NOURISHING database) New York City Health Code 2015 (NOURISHING database)
UD3: Refers to nutrient profiling system, but specific cut offs not provided	International Choices program criteria applied to food groups (Czech Republic and Poland) [A] "low star foods": Foods with more stars are healthier than similar foods with fewer stars. Packaged foods are given a number of stars based on their nutrients, ingredients and the amount of energy (kilojoules) they provide. Manufacturers work out the rating of their product by putting nutrition information into the 'Health Star Rating Calculator'. Foods get more stars if they	None	Czech Republic and Poland NZ Australia	N O	Re Choices program: Products must meet nutritional criteria set by an independent scientific committee. In the Netherlands, the Choices logo was introduced in 2006, but is no longer supported by the Government. In Belgium, the logo was introduced in 2007 but is no longer supported by the Government. The logo was introduced in the Czech Republic in 2011, and in Poland in	Czech Republic/Poland labelling policy (NOURISHING database) NZ1: NZ Health Dept 2017 (Choosing between packaged foods) NZ2: NZ Govt 2017 (Fuelled4Life) Description of Aust/NZ HSR scheme (NOURISHING database)

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	are: - lower in saturated fat, sugar or sodium (salt) - higher in healthy nutrients and ingredients (fibre, protein, fruits, vegetables, nuts or legumes). (NZ1) "sometimes foods": [in contrast to "Everyday foods", as classified using the Food and Beverage Classification System nutrient framework for schools and early learning services] (NZ2) [B] "least healthy (1/2 star)": The Health Star Rating system takes into account four aspects of a food associated with increasing risk for chronic diseases; energy, saturated fat, sodium and total sugars content along with certain "positive" aspects of a food such as its content of fruit, vegetables, nuts and legumes, and in some instances, dietary fibre and protein. (Aus/NZ)				2008. EVALUATED: Vyth EL et al. (2009). A front-of-pack nutrition logo: a quantitative and qualitative process evaluation in the Netherlands. Journal of health communication, 14(7), 631-645; Vyth EL et al. (2010). Actual use of a front-of-pack nutrition logo in the supermarket: consumers' motives in food choice. Public health nutrition, 13(11), 1882-1889 Re HSR: Application evaluated (process level) Jones et al (2018) Uptake of Australia's Health Star Rating System. Nutrients 10(8): 997; Mhurchu et al (2017) Effects of a voluntary front-of-pack nutrition labelling system on packaged food reformulation: The Health Star Rating system in New Zealand. Nutrients 9(8):918; Health Star Rating Advisory Committee (2017) Two year progress review report on the implementation of the Health Star Rating system, June 2014-June 2016.	
UD4: Refers to nutrient profiling system, and healthier vs less healthy foods - range of models	None in websites – see peer reviewed literature					
UE. Other – food habit focussed						
UE1: Fast food	WCRF: processed foods high in fat, starches or sugars; readily available convenience foods that tend to be energy dense and are often consumed frequently and in large portions. [Examples given are burgers, fried chicken pieces, chips and high-calorie drinks (containing sugars, such as cola, or fat, such as shakes)]	None	Internat'l	I(2)		WCRF 2018 (Limit 'fast foods' [guidelines for cancer prevention])
UE2: Out-of-home eating	dishes contain 2,300mg of sodium or more	None	New York	N	NY: chain restaurants are required to put a warning label on menus and menu boards,	New York City Health Code 2015 (NOURISHING database)

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					in the form of a salt-shaker symbol (salt shaker inside a triangle), when dishes contain 2,300mg of sodium or more	
UE3: Ready-to-eat meals	None in this category					
UE4: Snacks	**INTERNATIONAL WEBSITES** CDC: Packaged snacks: contain ≤200 mg sodium per package; have 0 grams of trans fat. At least 75% of packaged snacks meet the following food and nutrient standards: Have as the first ingredient: a fruit, a vegetable, a dairy product, or a protein food; or Be a whole grain-rich grain product; or Be a combination food that contains at least ¼ cup of fruit and/or vegetable. AND Nutrient Standards: Calorie limit: ≤200 calories. Saturated fat limit: <10% of calories. [Exemptions listed] Sugar limit: ≤35% of weight from total sugars in foods. [Exemptions listed.]	None	Internat'l	O S		US CDC 2019 (Healthy Food Service Guidelines)
	NATIONAL WEBSITES China has developed guidelines specific to snacks for children and adolescents (2008). [no further detail]			I(2)		Chinese guideline (NOURISHING database)
UF. Sugar and sugar-sweetened beverages (SSBs)						
UF1: Added sugar	Foods with added sugar, beverages sweetened with both sugar and artificial sweeteners and foods that display a red label* (Israel) Non-alcoholic beverages containing added sugar or sweeteners, chocolate, sugar and sugar products (Norway)	None	Israel Norway	O U	Regulation of foods provided to children at after school programs; extended in 2018 to school kiosks (canteen offerings in schools): Foods with added sugar, beverages sweetened with both sugar and artificial sweeteners and foods that display a red label, cannot be provided. * No further explanation on website of "red label" Consumption associated with negative health outcomes	Ref to Israeli Govt's Lunch-Program-Healthy Nutrition Regulation 2017 (NOURISHING database) Ref to Norway's sugar taxes 1981 (NOURISHING database)

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UF2: Free sugars	WHO: include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates. [1] WCRF clarifies: "Free sugars do not include sugar that is naturally built into the structure of foods or to sugars naturally present in milk and milk products." [2]	[1] WHO NUGAGDiet and Health [2] WHO Guideline Sugars intake 2015	Internat'l	All [WCRF]	WHO 2015: … increasing concern that intake of free sugars – particularly in the form of sugar-sweetened beverages – increases overall energy intake and may reduce the intake of foods containing more nutritionally adequate calories, leading to an unhealthy diet, weight gain and increased risk of NCDs. Consumption associated with negative health outcomes	WHO 2015 (Guideline: Sugar intake for adults and children) WCRF 2015 (Curbing global sugar consumption: Effective food policy actions to help promote healthy diets & tackle obesity)
UF3: High sugar foods	sugar and foods high in sugar (soft drinks, candies, chocolate, pastries, desserts, etc) (France)	None	France	S		French Govt policy regulating SSBs in schools, restaurants, facilities used for children e.g. sports facilities (NOURISHING database)
UF4: SSBs incl energy drinks & fruit juice	Any liquids that are sweetened with various forms of added sugars [CDC lists many examples]. Include, but are not limited to, regular soda (not sugar-free), fruit drinks, sports drinks, energy drinks, sweetened waters, and coffee and tea beverages with added sugars. [1] US CDC (2017b): SSBs do not include diet drinks; 100% fruit juice; beverages sweetened by the participant, including coffee and teas; alcohol; or flavored milks. [2] WHO 2017: does include "fruit/vegetable juices and drinks, liquid and powder concentrates, flavoured water, energy and sports drinks, ready-to-drink tea, ready-to-drink coffee, and flavoured milk drinks" [3]	[1] US Dietary Guid'line2 015-2020 [2] Rosinger et al 2017: 2011–2014. [3] WHO 2015 guid'lineWHO 2015: Fiscal policies 2015	Intern'l	I(2) M&S U	WHO 2017: Implementing a tax on sugar-sweetened beverages (SSB) is proposed as a policy option to support a reduction in consumption of free sugars in accordance with WHO Guideline on Sugars Intake (19) and as part of a comprehensive approach to addressing the prevention of obesity as recommended by the WHO Commission on Ending Childhood Obesity (ECHO). WCRF – part of policy guide aimed at reducing NCDs	US CDC 2017 (Get the Facts: Sugar-Sweetened Beverages and Consumption) US CDC 2017b (QuickStats: Percentage of Total Daily Kilocalories Consumed from SSBs …) WHO 2017 (Dietary interventions for the appendix 3 of the Global Action Plan for Non Communicable Disease) WCRF 2018 (Building momentum: lessons on implementing a robust sugar sweetened beverage tax)
	[Specify beverage types] Drinks with added sugar, excluding milks or yoghurts (Mexico) Non-alcoholic beverages (except water and dairy based drinks) (Austria) Non-alcoholic, water and juice- based (Ireland)	None	Austria Belgium Catalonia Chile Finland France Ireland	O U I S	Definitions mostly used for differential taxation (Austria, Belgium, Catalonia, Chile, Finland, Ireland, Mexico, Portugal, South Africa, UK + US cities) + ban on SSBs in vending machines in NHS hospitals in Wales Portugal: Application evaluated Goiana-da-Silva et al (2018). The future of the	Austrian Ministry of Labour, Social Affairs, Health and Consumer Protection nd (Nutrition Policies and Actions in Austria) Finland's tax system (NOURISHING database)

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	Including beverages with added sweeteners including energy drinks and waters (Chile, Belgium, Portugal, South Africa) + fruit syrups, sports drinks, energy drinks, fruit and vegetable nectars, fruit- and vegetable-based drinks, as well as water-, milk- or cereal-based beverages (France 1) + "chocolate drinks, cold tea and coffee drinks … sweetened milk, alternative milk drinks, milkshakes and milk drinks with fruit juice" but NOT "natural fruit juices, alcoholic beverages, sugar-free soft drinks and alternatives to milk with no added caloric sweeteners" (Catalonia) **[Quantify sugar content]** Soft drinks with added sugar content of at least 5g/100ml (Wales, UK) Beverages with more than 0.5% sugar and other non-alcoholic beverages (differential tax rates) (Finland) Drinks with more than 6.25g sugar/100ml taxed at higher rate (Chile) Tax/levy on drinks with added sugar content 5-8g/100ml and >8g/100ml (higher rate (Ireland, Catalonia, UK) Tax on all non-alcoholic beverages with sugar; higher tax on sugar content > 80g per litre (Portugal) Levy per g of sugar applied to drinks with over 4g/100ml sugar (South Africa) Excise tax proportional to the sugar content, per kilogram of added sugar per hectoliter up to 15kg (France 2) + several US cities (cut offs not extracted)		Mexico Portugal South Africa Wales UK USA (Boston, Berkeley, Albany, Philadelphia, Boulder, Oakland, Washington, San Francisco)		sweetened beverages tax in Portugal. The Lancet Public Health 3(12), PE562 Also application evaluated - impacts of SSB taxes in Boston, Berkeley, Philadelphia	Belgian Govt SSB tax (NOURISHING database) France 1: Ref to French Govt policy regulating SSBs in schools, restaurants, facilities used for children e.g. sports facilities (NOURISHING database) France 2: Ref to French Govt SSB tax (NOURISHING database) Irish Govt SSB tax (NOURISHING database) Mexican Govt SSB tax (NOURISHING database) Portugese Govt SSB tax 2017 (NOURISHING database) South African SSB tax 2017 (NOURISHING database) Catalonia's sugary drinks tax 2017 (NOURISHING database) Welsh Govt vending machine policy 2008 (NOURISHING database) UK government's Soft Drinks Industry Levy 2018 (NOURISHING database) All refs to US state/city legislation to tax SSBs from NOURISHING database
UF5: artificially sweetened beverages	Israeli regulation of foods in schools prohibits beverages sweetened with both sugar and artificial sweeteners (Israel – see UF1) ***See also UF1 and UF2***					
UG. Other – food-based dietary guidelines						

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Term and Taxonomy code	Common definition	Source	Country	Appli-cation	Comments; Evaluation; Health outcome; Strengths; Limitations	References
UG1: Food-based only	None					
UG2: Food-based and only negative nutrients	e.g. avoid/limit fat, sugar, salt (all listed) + limit red meat consumption (Greece, Iceland [specifies <500g/week], Norway, Poland, Sweden) and processed meat (Iceland, Norway) Choose lean meats (Denmark, Slovenia) + SSBs (Mexico, Finland) Finland: also "Avoid products made of refined flour with plenty of hard fat and sugar" Turkey: specifies "decreasing consumption of saturated fat (butter, margarine, animal fat)" Israel: Use less oil; limit foods high in sat fats/trans fats such as cakes and biscuits Denmark: adds Choose lean meats and cold meats NZ: adds "should be mostly whole or less processed" [1]	None [1] National Dietary Guidelines	Denmark Finland France Germany Greece Hungary Iceland Israel Italy Korea Mexico Netherlands New Zealand Norway Poland Slovenia Spain South Africa Turkey	[generally not specified – but some have O, N, I]		Ministry of Health website (with no further details) unless listed here: Denmark: Danish Ministries of Environment and Food nd (Nutrition and labelling) Finland: Finnish Food Authority & The Ministry of Social Affairs and Health (Nutrition Commitment) Netherlands: Dutch Ministry of Health, Welfare and Sport nd (Promoting the production of healthy food) Norway Directorate of Health nd (Keyhole- easier to choose healthier) Spain: Agency of Consumption, Food Security and Nutrition 2010 (Consensus document on food in educational centres) NZ Health Dept 2016 (Healthy Food and Drink Policy for Organisations)
UG3: Food-based and only positive nutrients	None					
UG4: Food-based and positive and negative nutrients	Switch to wholemeal; healthier fat; low-fat dairy. Choose low-fat, unsweetened products enriched with vitamin D. Eat less red and processed meat; less salt; less sugar.	None	Sweden	N		Swedish Food Agency 2019 (The Keyhole)
UG5: Nutrient-based only	"Avoid too much salt and fat" (Japan) "Reduce salt and oil, and limit sugar and alcohol" (China)	Japan China				Japan: Ministry of Health, Labour and Welfare website Chinese Nutrition Society website

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5.3.4. Synthesis of definitions of 'healthy' food and drinks

5.3.4.1. Definitions of 'healthy' food and drinks in the peer reviewed reviews

The regrouped (reordered) data extraction table for 'healthy' food and drinks in the peer reviewed reviews is included at Appendix 5A. The corresponding summarised data synthesis is included in Table 10.

Fewer (n=36) peer reviews defined 'healthy' food and drinks compared to 'unhealthy' food and drinks (n=100) (Appendix 4A, Appendix 5A). Across all the potential action areas of the NOURISHING (plus) framework relevant to application of definitions of 'healthy' food and drinks in the included peer reviewed reviews:

- the most commonly identified broad and sub categories of food classification systems, according to the taxonomy outlined in Table 5, were descriptive synonyms (41%), of which 40% focused on positive nutrients (Appendix 5A)
- a quarter of peer-reviewed reviews used the term or concept of core foods associated with food-based dietary guidelines to define 'healthy foods', and another quarter used nutrient profiling systems to define 'healthier' choices (Appendix 5A).

Table 10 synthesises the categories of food classification systems consistent with the taxonomy outlined in Table 5, according to any common definition of 'healthy' food and drinks applied, the source of the definition of the term, the country where it is used, the sector using the term (including any conflict of interest), the potential action areas of the NOURISHING (plus) framework in which the term has been applied, any other comments, and reference citations. As the classification of 'healthy' food and drinks tends to be the reverse of 'unhealthy' food and drinks in most food classification systems, the results of any process, impact or outcome evaluation related to application of the term reflected the evaluation results captured in Table 8, so were omitted from Table 10 to aid readability.

Many peer-reviewed reviews identified fruit and vegetables as healthy foods, but there was less consistency with other food groups (Table 10). Unlike for 'unhealthy' food and drinks (Table 8), few reviews acknowledged the lack of clarity around the terms for 'healthy' food and drinks used or acknowledged any lack of consensus around definitions of 'healthy' food and drinks in the literature (Table 10); however large variations in terminology and definition were apparent (Table 10). Several reviews used terms that are not necessarily related to the healthiness of specific foods, such as "natural" and "fresh", however the converse of these terms was not used to define 'unhealthy' food and drinks (Table 8). A higher proportion of peer-reviewed reviews cited national food-based dietary guidelines as the source of the definition of 'healthy' food and drinks (Table 10) than was cited for 'unhealthy' food and drinks (Table 8). As found in Phase One of this project [4], definitions provided were not necessarily consistent with those in the dietary guidelines cited. Those reviews using nutrient profiling systems with system-level cut-points to identify 'healthy' food and drinks, tended to use alternate terms, such as "green" or "keyhole", rather than describe them simply as 'healthier' (Table 10).

There were some difference across sectors, with authors with food industry connections critical of the NOVA framework specifically (Table 8). Public health nutrition researchers tend to highlight the great diversity, arbitrary nature, and lack of impact and outcome evaluation, of nutrient profiling systems globally, calling for the need for consensus and further evaluation research, especially at outcome level (Table 8).[21]

Different categories of food classification systems were used for different policy applications (Table 8).

[21] Further examples of food classification system preferences in other sectors were also apparent from analysis of websites (see section 5.3.4.2).

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Table 10. Summary of definitions and characteristic of 'healthy' food and drinks from peer reviewed literature reviews*

Term	Common Definition	Source	Country	Sector/vested interest/COI	Appli-cation	References*
HA: Healthy foods						
HA1: Nutrient rich, low energy density	Foods high in nutrients that are pro-health (such as fibre and unsaturated fat) (Eyles) Nutrient-rich, low-energy-dense foods such as fruits and vegetables….. Eligible foods mainly consisted of fruits/vegetables and low-fat snacks, and eligible beverages mainly consisted of fruit juice, vegetable soup and low-fat milk. (An) More nutrient dense, lower calorie, lower salt, lower sugar, lower cholesterol, or lower fat. More nutrient dense *outcomes* included consumption *or purchase* of more vegetables, fruits, whole grains, and other items *reasonably identified and justified in the literature as healthy alternatives*. (Arno)	None US Dept. of Health and Human Services, Healthy People 2000 US Dept of Health, Dietary Guidelines for Americans Feenstra, G., 2002. Creating space for sustainable food systems. Agric. Hum. Value	Internat'l USA	None Nicklas - Dairy Council sponsored	N U R I S I(2)	Eyles 2012 (SR – n) [39] An 2013 (SR - n) [34] Arno 2016 (MA – n) [37] Kraak 2011 (SR – n) [48] Nicklas 2009 (C – n) [25] Pinard 2016 (SR – n) [69]
HA2: low in negative nutrients	Defined based on *lower calorie or fat content*. Groups included: F&V; other healthful foods (including low fat products, whole grain pizza, dairy products); healthful beverages (including low fat milk, low calorie beverages)	none	Internat'l	Afshin - one author food and pharma funding	U,	Afshin 2017 (MA- n) [57]a
HA3: Multiple definitions	Items recommended to consume, such as salads, soups, low-fat dairy, lean meat, low-fat desserts, fish and seafood, water, diet soda, and foods higher in dietary fiber, vitamin C, and calcium (Shangguan) *Healthy eating behaviours* = increased selection/consumption of *fruits and/or vegetables*, increased selection of more nutrient-dense food ('healthier' choices), or decreased selection of *low-nutrient energy-dense* foods. (Kessler) Define healthy foods as being *low in saturated fat, added sugars, and/or sodium,* and containing at least a *minimum amount of one of the five major food groups* (Carlson)	None Dietary Guidelines for Americans, 2010	Internat'l USA	none	N I O U S	Shangguan 2019 (MA – n) [53] Kessler 2016 (ScR – n) [97] Carlson 2014 (C – n) [98]
HA4: Food based examples	Healthy items, particularly fruits, vegetables, lean meats, and sugar-free beverages (Brown) Pomeranz adds ' seafood and low fat dairy' "*Fresh*" 'healthy' "*unprepared*," or "*staple*" foods may include fruits and vegetables, seeds, nuts and nut butters, whole grains, beans & legumes, raw animal products (e.g. eggs, meat, fish, milk), bread & baking ingredients (Huang) Niebylski (2): not clearly defined but often followed by i.e. fruit & vegetables	None	Internat'l USA	None Huang – one author food and pharma funding. Not reported	U I O N R N(2)	Brown 2015 (PS – n) [54]b Huang 2018 (ScR – n) [58] Pomeranz 2015 (C –n) [45] Evans 2015 (ScR –n) [56]e Niebylski(2) 2015 (SR– n) [44]
HA6: 'healthy' but no definition	'healthy and nutritious'	Healthy Weight, Healthy Lives: A Cross-Government Strategy for England, 2008	UK	None	O S	Bristow 2011 (ScR –n) [99]

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Table 10. Summary of definitions and characteristic of 'healthy' food and drinks from peer reviewed literature reviews*

Term	Common Definition	Source	Country	Sector/vested interest/COI	Appli-cation	References*
HA7: Associated with decreased levels of NCD/obesity	The foods to be monitored should be able to be easily defined and should link clearly with risk of obesity and/or NCDs. These include healthy items such as fruits and vegetables	Lock et al, 2005, Global BOD attributable to low consumption of fruit and vegetables. WHO Bull	Internat'l	None	M&S S	Ni Mhurchu 2013 (SR – n) [55]
HA8: Staples – local food production	Foods *supplying the major proportion of energy in a diet*. Staples are adapted to the *local crop production and vary from place to place*. Can include "cereals/grains" (e.g. rice, wheat); "starchy vegetables/roots" (e.g. potatoes, cassava); and "starchy fruits" (e.g. plantains, breadfruit)	none	North and South America	None	I(2)	Montagnese 2017 (ScR – n) [36]
HB. Core / Food groups						
HB1: Nutrient rich and/or low energy density	Healthy (core) food groups such as fruits, vegetables, and whole grains…. healthy (core) foods have a significantly different nutrient profile than do discretionary choices. Jensen adds 'bread and milk' From the fundamental 5 food groups: vegetables, fruits, grains (whole grains), low-fat milk and dairy, and quality protein sources (e.g. lean meats, fish, nuts, nut butters, seeds, eggs) (Murray)	None Dietary Guidelines for Americans, 2010.	Internat'l USA	None Murray – Dairy Council, Nestle	N O U R I I(2)	Grieger 2017 (SR–n) [61] Grieger 2016 (ScR–n) [62] Jensen 2018 (C – n) [33] Johnson 2016 (SR –n) [63] Murray 2015 (PS – n) [64] Driessen 2014 (SR –n) [100]
HB4: As per NHMRC (or other DGs) definition	Foods whose consumption is recommended by national diet guidelines, such as the *American diet guidelines and Danish diet guidelines*, as healthy. Examples of healthy foods targeted include whole grains, F&V, lower-fat milk, healthier beverages, lower sugar cereals, low-calorie beverages, vitamins A & D, calcium and fish. Messages about food and diet should support *national dietary guidelines* (Galbraith-Emami) 'Basic food' product groups were based on product group classifications from *food-based dietary guidelines* used in more than 20 countries worldwide (Roodenburg)	Glanz K, Yaroch AL. Strategies for increasing fruit & vegetable intake in grocery stores & community Prev Med. 2004 Dietary Guidelines for Americans, 2010 WHO Global Strategy on Diet, Physical Activity and Health, 2004	Internat'l USA Europe	None	S O R N I M&S	Adam 2016 (SR – n) [31] Galbraith-Emami 2013 (SR – y) [101] Roodenburg 2011 (C–y) [23]
HC. Unprocessed						
HC1. Natural or minimally processed foods	Natural foods are those obtained directly from plants or animals (such as vegetables and fruits, or eggs and milk) and acquired for consumption without having undergone any alteration following their removal from nature. Minimally processed foods are natural foods that have been submitted to cleaning, removal of inedible or unwanted parts, fractioning, grinding, drying, pasteurization, cooling, freezing or other processes that do not add substances to the original food. The purpose of minimal processes is to preserve foods, to make it possible to store them, and sometimes also to simplify food preparation	Ministry of Health of Brazil (2014) Dietary Guidelines for the Brazilian Population	Brazil Intern'l	None Huang – one author has food and pharma funding.	H U R I I(2)	Monteiro 2015 (C – n) [66] Capewell 2018 (C – n) [50] Huang 2018 (ScR – n) [58]

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Table 10. Summary of definitions and characteristic of 'healthy' food and drinks from peer reviewed literature reviews*

Term	Common Definition	Source	Country	Sector/vested interest/COI	Appli-cation	References*
	(cleaning and removing inedible parts), or to help their digestion, or make them more palatable (grinding or fermentation). (Monteiro) "*Fresh*" 'healthy' "*unprepared*," or "*staple*" foods may include fruits and vegetables, seeds, nuts and nut butters, whole grains, beans & legumes, raw animal products (e.g. eggs, meat, fish, milk), bread, and baking ingredients (Huang) Capewell specifies '*Plant foods'* that are unprocessed and unrefined, or processed and refined as little as possible, before being consumed.	none				
HD. Nutrient profiling						
HD1: Nutrient rich foods; no mention of profiling system or cut-offs provided. Also "Health Claim eligible"	Product was defined as healthy if it was eligible to carry a health claim based on the Australia and New Zealand 2007 Food Standards Agency Nutrient Profiling guidelines	Kelly B, et al. (2009) Consumer testing acceptability & effectiveness of FOPL systems for the Australian grocery market. Health Prom Int	Intern'l	none	N	Hawley 2013 (SR – n) [46]
HD2: Nutrient cut-offs provided ***Keyhole product*** ***Green Foods***	Keyhole: Contain a reduced amount of one or more of the following: total fat; saturated and trans fatty acids; added sugar; salt (sodium); and/or a high amount of fibre (36). It is mostly calculated on a per-100 g basis, although for some products and nutrients the criteria are calculated on per 100 kcal or per cent energy basis. 'Sugar' refers in some foods to the added sugar content and in other foods to the total sugar content. Green foods: less than or equal to: 3g fat; 1.5g saturated fat, 5g total sugars, 0.3g salt (Lobstein)	Livsmedelsverket (National Food Administration) (2005) Food Standards Agency (2007) FOP Traffic Light Signpost Labelling Technical Guidance	Europe	None	N, R, M&S	Lobstein 2009 (C – n) [11]
HD3: Refers to nutrient profiling system, but no details (no website)	Green foods include low-fat carbohydrates, fruits and vegetables, and lean meat as well as small portions of pure fruit juice	New South Wales (NSW) policy for school canteens	Internat'l	None	O	Evans 2015 (ScR – n) [56]
HD4: Reviews nutrient profiling systems	No clear definition as papers were reviewing a number of different combinations of nutrients and food components that could possibly be used for nutritional profiling	none	Internat'l Europe	None Labonte – two authors have food industry links	N, O, U, R I(2), S, M&S	Foltran 2010 (C – n) [22] Labonte 2018 (SR – y) [3] Lobstein 2009 (C – n) [11] Rao 2013 (MA – y) [72]

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** Key for references column: SR = systematic review; MA = meta-analysis; C = commentary; ScR = scoping review; PS = position statement
Y = yes, definition of healthy/unhealthy terms from original papers extracted in review's summary table/s; N = no, definition of healthy/unhealthy terms not from original papers extracted in review's summary table/s

5.3.4.2. Definitions of 'healthy' food and drinks in websites

The reordered data extraction tables for 'healthy' food and drinks in international and national websites are included in Appendices 5B and 5C respectively. The corresponding summarised data synthesis is included in Table 11.

Across all the potential action areas of the NOURISHING (plus) framework relevant to application of definitions of 'healthy' food and drinks provided in included international websites:

- the most commonly identified broad and sub categories of food classification systems, according to the taxonomy outlined in Table 5, were descriptive synonyms (63%), of which a third provided multiple definitions (Appendix 5B)
- core food definitions consistent with food-based dietary guidelines were also mentioned (42%), as were sugar and sugar sweetened beverages (10%); no international websites mentioned nutrient profiling or processing-based systems to define 'healthy' food and drinks.

With respect to the included national websites:

- the most commonly identified broad and sub categories of food classification systems were descriptive synonyms (46%) of which 69% provided prescriptive accompanying food lists (Appendix 5C)
- in marked contrast to international websites, national websites frequently used nutrient profiling systems (32%) to identify 'healthier' foods; another 5% of national websites categorised 'healthy' food and drinks on the basis of food processing level (Appendix 5C).

Table 11 synthesises the categories of food classification systems in the websites consistent with the taxonomy outlined in Table 5, according to any common definition of 'healthy' food and drinks applied, the source of the definition of the term, the country where it is used, the potential action areas of the NOURISHING (plus) framework in which the term has been applied, results of any process, impact or outcome evaluation related to application of the term, any other comments, and website sources. No websites identified specific sectors or potential conflict of interest, so this field was removed from the summary table (Table 11).

No websites acknowledged the lack of clarity around the terms for 'healthy' food and drinks applied nor the lack of consensus around definitions of 'healthy' food and drinks. They tended to be more focused on particular applications of food classification systems than the peer-reviewed reviews, particularly food-labelling, reformulation, healthy food procurement strategies (especially in schools) and on communication and education initiatives (Table 8; Table 9). Food-based dietary guidelines and publication of specific food lists were popular on international websites, whereas nutrient profiling systems were dominant on the national websites, with some notable country differences, such as the NOVA system based on degree of food processing in Brazil, and the application of warning signs in Chile (Table 9).

Differences between food classification systems used in the peer-reviewed reviews and on national and international websites were also apparent. There were also differences in the systems preferred by different sectors, with websites of health protection and food regulation agencies predominantly using nutrient profiling systems, and the websites of broader public health and education sectors preferring application of food-based dietary guidelines and specific food lists (Table 9).

As in the peer-reviewed reviews, different categories of food classification systems tended to be used for different policy applications (Table 9). The evaluations cited on the websites tend to report at the level of process evaluation (such as reach, acceptance and uptake of the policy action) or, less frequently, at the level of impact of the policy action, such as change in purchasing habits following introduction of a sugary drinks tax, rather than any evaluation of the food classification system applied during the process (Table 9).

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Content on the websites appeared to be underpinned by an assumption that increased consumption of 'healthy' or 'healthier' foods, however they were defined, would lead to health benefits. While there is a strong evidence base for the former (Appendix 5A) the assumptions regarding the latter rarely have been tested in the literature (Appendix 4A).

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Table 11. Summary of definitions and characteristics of 'healthy' food and drinks in international and national websites

Term	Common definition	Source of definition	Country	Applic-ation	References
HA. Healthy food and/or drinks					
HA1: Nutrient rich and/or low energy density; high in positive nutrients	**INTERNATIONAL** Low energy-dense foods e.g. wholegrains, cereals, fruits, vegetables and salads	None	UK		SIGN 2010 (Management of Obesity: Quick Reference Guide) SIGN 2010 (Management of Obesity: A national clinical guideline)
HA2: low in negative nutrients e.g. low fat, low sugar	**INTERNATIONAL WEBSITES** "healthier products": pursue reformulation and innovation to increase the number of available products which contain less saturated fat, less fat, less salt and/or increase the number of available products which are baked/contain more positive nutrients (EU1) decrease sodium, sugar and saturated fats in its products through gradual, science-based renovation in order to meet sound scientific nutritional criteria while meeting consumers' preferences (EU2) "good food choices": lower in saturated fat, sugar and salt (SIGN) [1]	None [1] NHS: the Eatwell Guide	EU UK	I M&S	European Union Platform on Diet, Physical Activity and Health 2013 (European savoury snacks industry commitment in the area of product development and choice) European Union Platform on Diet, Physical Activity and Health 2013 (Nestle to provide nutritionally sound products for all consumers) SIGN 2017 (Preventing cardiovascular disease: A booklet for patients, their families and carers)
	NATIONAL WEBSITES ban on trans fat and deep-frying, and maximum levels of sodium in food and calorie levels of beverages (Massachusetts) "healthier choices": per limits on the permissible content of fat, saturated fat, sugar and salt/sodium The Dutch government's food policy … encourages the food industry to produce food that contains less salt, fat and sugar.	None	Netherlands USA (Mass) Wales	O I	Massachusetts State Agency Food Standards 2009 (NOURISHING database) Welsh Govt vending machine policy 2008 (NOURISHING database) Netherlands: Dutch Ministry of Health, Welfare and Sport (Promoting the production of healthy food)
HA3: Multiple definitions	**INTERNATIONAL WEBSITES** "healthy foods": Fruit, vegetables, legumes (e.g. lentils and beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat and brown rice). At least 400 g (i.e. five portions) of fruit and vegetables per day (2), excluding potatoes, sweet potatoes, cassava and other starchy roots. Less than 10% of total energy intake from free sugars …. Less than 30% of total energy intake from fats [with food examples]. In particular, industrially-produced trans fats are not part of a healthy diet and should be avoided. Less than 5g of salt (equivalent to about one teaspoon) per day. (WHO) [1]	[1] Multiple sources – see spreadsheet [2] Dietary Guidelines for Americans, 2010 [3] Saelens et al. Nutrition environment measures study in restaurants (NEMS-R). Am J Prev Med. 2007;32(4):273-281; Nemours Health and Prevention Services. Healthy vending guide.	International US	I(2) S O	WHO 2018 (Healthy diet) CDC 2018 (Healthier Food Retail (HFR) Action Guide) CDC 2015 (A Toolkit for Creating Healthy Hospital Environments: Making Healthier Food, Beverage, and Physical Activity Choices) European Union Platform on Diet, Physical Activity and Health 2017 (Mondelēz International global commitment to Wellbeing Snacks and Inspiration to Mindful Snacking)

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Table 11. Summary of definitions and characteristics of 'healthy' food and drinks in international and national websites					
Term	**Common definition**	**Source of definition**	**Country**	**Applic-ation**	**References**
	"healthier foods": include fruits, vegetables, whole grains, fat-free and low-fat dairy products, seafood, and foods with less sodium (salt), saturated fats, trans fats, cholesterol, added sugars, and refined grains. Healthier beverages include fat-free or low-fat milk and milk products, fortified soy beverages and other lactose-free products, 100% juice, and water. (CDC) [2] "healthy snacks/foods (Green Go)": Fruits, dried or fresh (no added sugar or syrup) Vegetable, not fried (no added sauces) Whole nuts or seeds (no added salt or sugar) that meet Green calorie and fat criteria ≤200 calories per portion as packaged; <10% of total calories from saturated fat; 0 g of trans fat; ≤35% of calories from total sugars; Yogurt: <30 g of total sugars/ 8 oz. serving; <230 mg sodium (Na)/serving; Meals ≤480 mg sodium/ serving (CDC) [3] "better choice products": products that firstly fulfill stricter nutrient requirements (for energy, saturated fat, sugar and sodium and energy per portion) and additionally have a relevant nutritional benefit, (e.g. wholegrain content or low in saturated fat) (Eu)				
	NATIONAL WEBSITES maximum and minimum levels of nutrients per serving; standards on specific food items (e.g. only no-fat or 1% milk); portion size requirements; the requirement that water be offered with food; a prohibition on the deep-frying of food; and daily calorie and nutrient targets, including population-specific guidelines (e.g. children, seniors) (New York) "green category foods": variety of foods from the four food groups, including: • plenty of vegetables and fruit • grain foods, mostly wholegrain and those naturally high in fibre • some milk and milk products, mostly low and reduced fat • some legumes, nuts, seeds, fish and other seafood, eggs, poultry (e.g. chicken) and/or red meat with the fat removed. Green category products are low in saturated fat, added sugar and added salt, and are mostly whole and less processed. (NZ) [2] "healthy food": upper limits for salt, sugar and fat content, and restrict (deep) fried products, sweet treats and soft drinks. (Estonia) Policy for healthy catering recommends syrup/sugar on side, not pre-added; include whole-grains in all staple option; use healthier cooking oils for all cooking and food preparation; limit deep fried items; include fresh fruits as option for all menus (Singapore 1)	None [2] National Dietary Guidelines	USA (NY) NZ Estonia Singapore	O	New York City's Food Standards 2014 (NOURISHING database) NZ Ministry of Health 2016 (National Healthy Food and Drink Policy) Ref to Estonian regulations on nutrition requirements for food served in school canteens (NOURISHING database) SG1: Singapore Ministry of Health 2017 (Whole of Government Healthier Catering Policy) SG2: Ref to Singapore's Healthy Meals in Schools Programme (NOURISHING database) SG3: Ref to Singapore's Healthier Dining Programme (NOURISHING database)

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Table 11. Summary of definitions and characteristics of 'healthy' food and drinks in international and national websites					
Term	**Common definition**	**Source of definition**	**Country**	**Applic-ation**	**References**
	reduce the amount of saturated fat, sugar, and salt in school meals and make available whole grains, fruit and vegetables as part of a balanced meal (Singapore 2) "healthier foods": lower calorie meals and use healthier ingredients such as oils with reduced saturated fat content, and/or whole grains, without compromising taste and accessibility (Singapore 3)				
HA4: Food based examples	**INTERNATIONAL** mainly based on vegetables, fruits, beans and pulses, wholegrains and fish (NICE) "healthy foods to encourage": variety of fruits, vegetables, whole grains, meats, and yogurt or cheeses (with example foods) (CDC) [1] fruit and vegetables, as well as legumes, whole grains and nuts (WHO)	None [1] Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion	International USA	I(2)	NICE guidelines 2015 (Preventing excess weight gain) CDC 2018 (Foods and Drinks for 6 to 24 Month Olds) WHO 2018 (Overweight and obesity)
	NATIONAL Specifies food types to be provided for "healthy breakfast" (1 serving of wholemeal or wholegrain cereals and breads and 1 serving of either milk, yogurt or cheese OR fruit), "healthy snack" and "healthy lunch". (Ireland) fruits and vegetables, whole wheat products, lentils, low-fat poultry and fish, and cooked food with no added salt, sugar and fat (Israel) fruit, vegetables and water (Mexico) milk, plain yoghurt, and fresh and frozen fruit and vegetables (Britain) plenty of vegetables and fruit; grain foods; some milk and milk products, mostly low and reduced fat; some legumes, nuts, seeds, fish and other seafood, eggs, poultry (e.g. chicken) and/or red meat with the fat removed (NZ) [2] "healthy meals": specifies food groups/types (e.g. starchy foods, fruit and vegetables, milk and dairy) to be provided each meal/day/week (UK)[1], (US3) [US adds requirement re reducing sodium, using products that contain zero g of trans fats, use single food-based menu planning approach] "healthy food": like meat, fish, eggs, milk and bread, as well as fruit and vegetables (Canada)	None [1] UK National Dietary Guidelines [2] NZ National Dietary Guidelines [3] SA National Dietary Guidelines [4] US national dietary guidelines	Britain Canada Denmark Finland Germany Ireland Israel Mexico Norway NZ South Africa UK USA	O S U N I	Irish Health Dept 2017 (Nutrition Standards for School Meals) Ref to Israeli Govt's Lunch-Program-Healthy Nutrition Regulation 2017 (NOURISHING database) Ref to Mexican mandatory food guidelines for schools (NOURISHING database) Ref to British Healthy Start programme (vouchers for pregnant women and/or families with children) (NOURISHING database) NZ Health Dept 2016 (Healthy Food and Drink Policy for Organisations) UK Dept of Health and Social Care 2019 (School food standards: resources for schools) Ref to Canada's Nutrition North Canada subsidy program (launched 2011) (NOURISHING database) Ref to South Africa's National School Nutrition Programme (NOURISHING database) Ref to German voluntary guidelines on quality standards for school meals (NOURISHING database)

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Table 11. Summary of definitions and characteristics of 'healthy' food and drinks in international and national websites					
Term	**Common definition**	**Source of definition**	**Country**	**Applic-ation**	**References**
	"healthy food" (e.g. fresh fruit, nuts, fish, brown bread sandwiches) and beverages in containers not exceeding 250ml (e.g. plain water, 100% fruit juice, unsweetened milk) (South Africa) [3] "healthy foods": recommend that schools provide water and unsweetened herbal or fruit teas, and prohibit drinks that are high in sugar including juices and energy drinks. The guidelines contain a 20-day plan suggesting serving whole grains on at least four days and potato products a maximum of four days; salad, vegetables or legumes each day; fruit at least eight times; dairy products (ideally low-fat) at least eight times; fish at least four times and meat a maximum of 8 times; rapeseed oil is the only permitted oil (Germany) "healthier products": reducing the content of salt, saturated fats and added sugar on the one hand, and increasing the intake of unsaturated fats, vegetables and fibre on the other (Finland) **[KEYHOLE foods]** "healthier foods": foods labelled with the Keyhole symbol contain less fat, sugars and salt and more dietary fibre than food products of the same type not carrying the symbol. Prepacked foods eligible to carry the Keyhole symbol must fulfil certain conditions specified by the authorities in Denmark, Iceland, Norway and Sweden. An exception has been made for fish, seafood, fruits, vegetables and potatoes, bread, cheese and unprocessed meat so they can be labelled with the Keyhole even though they are not prepacked. The criteria regarding fat, sugar, salt and dietary fibre are based on the Nordic Nutrition Recommendations. (Denmark) "keyhole foods": Packed foods eligible to carry the Keyhole symbol must fulfil certain conditions specified by the authorities in Sweden, Denmark, Norway and Iceland. Fish and seafood, fruits, vegetables and potatoes can be labelled without packaging. These conditions - regarding how much fat, sugars, salt, dietary fibre, wholegrain, fruit and vegetables may be present in foods with the Keyhole symbol - are based on the Nordic Nutrition Recommendations, which are founded on scientific research. (Sweden) "keyhole foods": contains more wholegrain and less saturated fat, salt and sugar than similar products without the Keyhole symbol. Soft drinks, candy, cakes and snacks cannot be labelled with the Keyhole. Food containing artificial sweeteners also cannot have the Keyhole label. (Norway)				Denmark: Danish Ministries of Environment and Food nd (Nutrition and labelling) Finland: Finnish Food Authority & The Ministry of Social Affairs and Health (Nutrition Commitment) Norway Directorate of Health nd (Keyhole- easier to choose healthier) NZ Health Dept 2016 (Healthy Food and Drink Policy for Organisations) US1: US Department of Agriculture, Food and Nutrition Services 2018 (What are Staple Foods?) US2: US Department of Agriculture, Food and Nutrition Services 2013 (What Can SNAP Buy?) US3: USDA Food and Nutrition Service 2019 (National School Lunch Program) US4: USDA Food and Nutrition Service 2019 (Child and Adult Care Food Program) US5: USDA Food and Nutrition Service 2019 (Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)) US6: USDA Food and Nutrition Service 2019 (Farmers Market Nutrition Program)

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Table 11. Summary of definitions and characteristics of 'healthy' food and drinks in international and national websites					
Term	**Common definition**	**Source of definition**	**Country**	**Applic-ation**	**References**
	[Authorised foods] "SNAP-authorised staple foods": the basic foods that make up a significant portion of a person's diet and are usually prepared at home and eaten as a meal. Categories are: 1. Fruits or vegetables; 2. Meat, poultry, or fish; 3. Dairy products; and 4. Breads or cereals. (US1) "SNAP-authorised foods": Fruits and vegetables; Meat, poultry, and fish; Dairy products; Breads and cereals; Other foods such as snack foods and non-alcoholic beverages; and Seeds and plants, which produce food for the household to eat. (US2) CACFP-authorised foods: meals and snacks served include a greater variety of vegetables and fruit, more whole grains, and less added sugar and saturated fat. (US4) [4] WIC-authorised food packages: supplemental foods designed to meet the special nutritional needs of low-income pregnant, breastfeeding, non-breastfeeding postpartum women, infants and children up to five years of age who are at nutritional risk [actual foods and portions specified on website] (US5) WIC-authorised fresh produce: fresh, nutritious, unprepared, locally grown fruits, vegetables, and herbs through farmers' markets and roadside stands (US6)				
HA5: Inverse of unhealthy	None				
HA6: 'healthy' but no definition	None				
HB. Core / food groups					
HB1: Nutrient rich and/or low energy density	None				
HB2: Reference to ADGs (or other DG) but non-standard definition	[School cafeterias aim to] improve their food and drink basket based on a guideline published by the Ministry (Leitlinie Schulbuffet) while taking into account their individual environment aiming at sustainable improvements based on healthy nutrition recommendations and their economic viability.	National guidelines	Austria	O U I	Austrian Ministry of Labour, Social Affairs, Health and Consumer Protection nd (Nutrition Policies and Actions in Austria)
HB3: Non-discretionary energy/calories/kJ	None				

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Table 11. Summary of definitions and characteristics of 'healthy' food and drinks in international and national websites					
Term	**Common definition**	**Source of definition**	**Country**	**Applic-ation**	**References**
HB4: As per NHMRC (or other DGs) definition	**INTERNATIONAL** Foods and drinks that meet dietary recommendations (CDC1) [1]: - for fruits, vegetables, whole grains, and non-fat or low-fat dairy products (CDC2)[2] - helps people to meet the eatwell plate guidance recommendations, and which does not contain high levels of salt, fat, saturated fat or sugar (NICE guidelines x 2) - to reduce sodium, fat and sugar content (FAO)	None [1] 2015-2020 Dietary Guidelines [2] 2010 US Dietary Guidelines	International US	N(2) O G S I(2)	CDC1: US Centres for Disease Control and Prevention 2019 (Healthy Food Service Guidelines) CDC2: US Centres for Disease Control and Prevention 2019 (Healthy Food Service Guidelines) NICE guidelines 2016 (Obesity in adults: prevention and lifestyle weight management programmes) NICE guidelines 2015 (Obesity in children and young people: prevention and lifestyle weight management programmes) UN FAO (Food-based dietary guidelines)
	NATIONAL "healthy food": four groups – vegetables and fruit, grain products, milk and alternatives, meat and alternatives – and two categories – Choose Most Often and Choose Sometimes. The guidelines suggest maximum levels for fat, sugar and salt, with the reference quantities being largely based on Health Canada's Canada Food Guide. (Canada) CFSP-authorised foods: based on the food group categories found at ChooseMyPlate.gov; actual foods and portions specified (US1) FDPIR-authorised food packages: based on the food group categories found at ChooseMyPlate.gov. Plus a food group called "Traditional Foods" including bison, blue cornmeal, wild rice, wild salmon, and catfish (US2)	National dietary guidelines	Canada USA	O	Ref to Canadian Guidance Document for the development of Nutrient Criteria for Foods and Beverages in Schools 2013 (NOURISHING database) US1: USDA Food and Nutrition Service 2019 (Commodity Supplemental Food Program) US2: USDA Food and Nutrition Service 2019 (Food Distribution Program on Indian Reservations)
HC. Unprocessed / minimally processed					
HC1. Minimally processed / unprocessed / 'natural' (NOVA)	**NATIONAL WEBSITES** "Whole foods" are very close to their natural state, and they have no added fat, salt or sugar. Examples include fresh vegetables and fruit, raw nuts, fish, eggs, chicken or red meat with fat removed	None	NZ	I(2)	NZ Health Department 2017 (Making healthier food choices)
HC2. Minimally processed / unprocessed /	"unprocessed and minimally processed food" – not defined (Brazil)	None	Brazil	H	Ministry of Health of Brazil procurement guidelines for food served or sold within the Ministry's

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Table 11. Summary of definitions and characteristics of 'healthy' food and drinks in international and national websites					
Term	**Common definition**	**Source of definition**	**Country**	**Applic-ation**	**References**
'natural' but no definition provided					facilities and in its entities 2016 (NOURISHING database)
HC3. Unpackaged foods	None				
HC4. Processing not specified (really nutrient density)	**NATIONAL WEBSITES** Nutritional standards for prepackaged food: 25 calories per 12 ounces are permitted in vending machines, with the following exemptions: 100% fruit juice with no added sugars or sweeteners	None	USA - San Francisco	O	San Francisco's Healthy Vending Machine Policy (NOURISHING database)
HD. Nutrient profiling					
HD1: Nutrient rich foods; no mention of profiling system or cut offs. Also "Health claim eligible".	None				
HD2: Nutrient cut-offs provided	**NATIONAL WEBSITES** "green category foods": products containing high levels of energy, fat, saturated fat, salt and sugar (UK) [1] "dark green (A) foods": [Foods to be favoured, as classified by the NutriScore label using a nutrient-profiling system, based on the UK Food Standards Agency model] Based on a scale of 5 colours: dark green to dark orange. The score takes into account per 100 grams whether the contents of the product include nutrients and food that should be favoured (including fibre, protein, fruit and vegetables) or nutrients that should be limited (including energy, saturated fatty acids, sugars and salt). The amount of nutrients per 100 grams contained in the product is scored using a points system (0–40 for nutrients that should be limited and 0–15 for nutrients that should be favoured). (Belgium, France1, Switzerland) Increase fibre, reduce the amount of salt, sugar, fat in staple foods by a firm commitment of economic actors as early as 2020 and	[1] UK Food Standards Agency [2] criteria have been revised by the Spanish Federation of Nutrition, Food and Diet Societies (FESNAD) and are based on those criteria established by the American Institute of Medicine of the National Academy of Sciences13 and on the limits specified by the Food Standards Agency	UK Belgium France Spain Switzerland Sweden US (San Francisco)	N O U I R	FSA labelling scheme (NOURISHING database) Description of Belgian Government's adoption of the NutriScore labelling system 2019 (NOURISHING database) France 1: Description of French Ministry of Health's nutrition labelling scheme (NOURISHING database) Swiss Food Safety and Veterinary Office 2019 (Healthy food choices) France 2: French Dept of Health 2019 (Health through diet [National Priority Prevention Plan]) Spain: Agency of Consumption, Food Security and Nutrition 2010 (Consensus document on food in educational centres Swedish Keyhole scheme (NOURISHING database) San Francisco's Healthy Food Incentives Ordinance 2011 (NOURISHING database)

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Table 11. Summary of definitions and characteristics of 'healthy' food and drinks in international and national websites

Term	Common definition	Source of definition	Country	Applic-ation	References
	promote the Nutri-Score, to improve the nutritional quality of all foods processed … [translated from French] (France2) "healthy pre-packaged foods": content per 100g: Energy ≤400 kilocalories; Total fat ≤15.6 g; saturated fat ≤4.4 g; trans fatty acids ≤1 g; sugars ≤30 g ; salt/sodium ≤1 g salt/400 mg sodium (Spain) [2] "keyhole foods": foods that contain less fat, salt and sugar (Sweden) meals must not contain more than 600 calories, 640mg sodium, 0.5g trans fat, 35% total calories from fat and 10% total calories from saturated fat, and must include a minimum amount of fruit and vegetables, while single food items and beverages must have <35% total calories from fat and <10% of calories from added caloric sweeteners (San Francisco)				
HD3: Refers to nutrient profiling system, but no details (no website)	**NATIONAL WEBSITES** "healthy meals": age-specific reference values for energy and nutritional content in school lunches and portion sizes, and drinks are limited to water and milk (Sweden) International Choice program criteria applied to food groups (Czech Republic and Poland) [A] "high star foods" (up to 5): Foods with more stars are healthier than similar foods with fewer stars. Packaged foods are given a number of stars based on their nutrients, ingredients and the amount of energy (kilojoules) they provide. Manufacturers work out the rating of their product by putting nutrition information into the 'Health Star Rating Calculator'. Foods get more stars if they are: - lower in saturated fat, sugar or sodium (salt) - higher in healthy nutrients and ingredients (fibre, protein, fruits, vegetables, nuts or legumes). (NZ1) "everyday foods": [in contrast to "sometimes foods", as classified using the Food and Beverage Classification System nutrient framework for schools and early learning services] (NZ) [B] "most healthy (5 star)": The Health Star Rating system takes into account four aspects of a food associated with increasing risk for chronic diseases; energy, saturated fat, sodium and total sugars content along with certain "positive" aspects of a food such as its content of fruit, vegetables, nuts and legumes, and in some instances, dietary fibre and protein. (Aus/NZ)	None	Australia Czech Republic and Poland Estonia NZ Poland Singapore Sweden	O N I I(2)	Ref to Swedish Good School Meals guidelines 2013 (NOURISHING database) Czech Republic/Poland labelling policy (NOURISHING database) NZ1: NZ Health Dept 2017 (Choosing between packaged foods) NZ2: NZ Govt 2017 (Fuelled4Life) Description of Aust/NZ HSR scheme (NOURISHING database) Estonia: National Institute for Health Development 2018 (Estonian Food Composition Database) SG1: Singapore Ministry of Health 2019 (Healthier Choice Symbol) SG2: Singapore Ministry of Health 2019 (Healthier Dining Programme) Poland 1: Ref to Poland's School Food Guidelines (NOURISHING database) Poland 2: Ref to use of Choices logo in Poland (NOURISHING database)

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Table 11. Summary of definitions and characteristics of 'healthy' food and drinks in international and national websites					
Term	**Common definition**	**Source of definition**	**Country**	**Applic-ation**	**References**
	"healthy food": The NutriData Food Composition Database contains data on the average nutrient composition of more than 3,300 food consumed in Estonia. Each food profile contains a maximum of 60 nutrients. (Estonia) "healthier foods": In line with the national nutrient claim guidelines, comparative claims i.e. Lower in sugar, are to carry a statement on the label qualifying the comparison. The new HCS logos carries nutritional taglines including, lower in sugar, lower in sodium, lower in saturated fat, higher in calcium and trans fat free. (Singapore) "healthier dining program": categories of claims of healthier foods include lower in calories; higher in wholegrains; healthier oils; source of dietary fibre; healthier beverages; healthier desserts (Singapore 2) "nutrient-based standards for food served in schools" (Poland 1) "products must meet nutritional criteria set by an independent scientific committee" (Poland 2)				
HD4: Reviews nutrient profiling systems	none				
HE. Other – food habit focussed					
HE1. Slow food	None				
HE2. Home cooked food	None				
HF4. 'Healthy' drinks	**INTERNATIONAL** "healthy beverages": water, low-fat milk beverages with no added sugars. When juice is available, offer 100% juice with no added sugars. At least 50% of available beverage choices contain ≤40 calories per 8 fluid ounces (excluding 100% juice and unsweetened fat-free or low-fat [1%] milk). At least 75% of available beverage choices contain ≤40 calories per 8 fluid ounces (excluding 100% juice and unsweetened fat-free or low-fat [1%] milk). (CDC)				CDC 2019 (Healthy Food Service Guidelines)
	NATIONAL "Healthy choice (green choice) drinks": no calorically-sweetened cold beverages; fruit and/or vegetable beverages must be 100% juice and where possible servings shall not exceed 8 ounces or 150 calories and be low-sodium varieties; milk, soy milk and other	[1] criteria have been revised by the Spanish Federation of Nutrition, Food and Diet Societies (FESNAD) and are based	USA (Boston) Spain Finland	O	All refs to US state/city legislation to tax SSBs from NOURISHING database

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Table 11. Summary of definitions and characteristics of 'healthy' food and drinks in international and national websites					
Term	**Common definition**	**Source of definition**	**Country**	**Applic-ation**	**References**
	milk substitute offerings are limited to 1% or skim milk, not exceeding 12 ounces in volume with <25 g of total sugars per 8 ounce serving; diet or other non-calorically sweetened beverages should be less than one third of total beverage offerings (Boston) "healthy drinks": content per 100ml: ≤100 kilocalories; total fat ≤3.9 g; saturated fat ≤1.1 g; trans fatty acid ≤0.25 g; sugars ≤7.5 g; salt/sodium ≤0.25 g/100 mg sodium (Spain) [1] "healthy drinks": fat-free milk/milk drinks and buttermilk, fortified with vitamin D. Other liquid dairy products and fermented milk products should be fat-free or low-fat products with a maximum fat content of 1%. Fresh water should be available as the primary beverage … "healthier beverages": water; endorsed with Healthier Choice Symbol (HCS) logo; or compliant with HCS sugar guidelines; or comply with the sugar guidelines for "Sweetened drinks – non-carbonated drinks" (≤6% total sugar). (Singapore) water, sparkling or flavoured water, with no added natural or artificial sweeteners, milk or non-dairy milk alternatives….. allow 100% juice in a serving size of no more than 8oz…...allows 100% juice under 40 calories (various US cities)	on those criteria established by the American Institute of Medicine of the National Academy of Sciences13 and on the limits specified by the Food Standards Agency	USA		Spain: Agency of Consumption, Food Security and Nutrition 2010 (Consensus document on food in educational centres) Ref to Finnish nutrition recommendations for school meals (NOURISHING database) Singapore Dept of Health 2018 (Whole-of-Government Healthier Drinks policy)

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5.3.5. Synthesis of results of Phase One

Phase One of this project was published separately [4]. It constituted a Rapid Evidence Review to determine how the term 'discretionary food and drinks' and/or related terms, concepts or criteria to differentiate 'healthy' and 'unhealthy' food and drinks are defined and applied by different sectors and groups (consumers, health professionals, educators and industry) in Australia.

Phase One included:

- a review of Australian Dietary Guidelines (ADGs) publications and associated resources – to identify how the term 'discretionary food and drinks' and synonyms is defined in those sources;
- a systematic review of peer reviewed literature and proffered documents – to identify how the term 'discretionary food and drinks' is defined and used by different sectors and for different applications;
- a literature review of published reviews defining 'healthy' and 'unhealthy' food and drinks in Australia and a review of blogs of selected social media influencers – to investigate how 'healthy' and 'unhealthy' food and drinks are being differentiated by different sectors and for different applications; and
- analysis of results of reviews to identify alignment with the definitions and intent of the term in the ADGs.

The review found 'discretionary food and drinks' are identified in a variety of ways within the ADGs publications and resources, including references to specific food names and quantified amounts, energy and/or nutrient density, dietary patterns and recommended consumption. While the definition is underscored by robust evidence of food, diet and health relationships from the literature [102], there is some inconsistency in the wording used in glossaries and descriptions of specific foods and drinks classified as discretionary in the suite of ADGs documents on the website at www.eatforhealth.gov.au

The literature review identified a wide variety of definitions and interpretations of the term 'discretionary food and drinks' in the peer-reviewed literature, proffered documents and websites reviewed (less than 40% of which included a definition that aligned with the ADGs definition). The term, concept and underlying evidence base appear relatively well understood and applied by dietitians/nutritionists, non-government organisations, and government preventive health sectors, but less so by other public health professionals, those from a science/social science background, non-health professionals, the food regulatory sector, and/or those with conflicting interests. The education and consumer sectors did not use the term frequently. It also was not commonly used by the food industry sector; nutrient profiling schemes were more commonly described.

Analysis showed the term 'discretionary food and drinks' is currently used in the two ways intended by the ADGs, to differentiate:

- 'unhealthy' diets and dietary patterns from 'healthy' diets and dietary patterns (most commonly by dietitians/nutritionists and clinical health professionals and in submissions to the Senate Committee Inquiry on the Obesity Epidemic 2018)
- 'unhealthy' food and drinks from 'healthy' food and drinks (in submissions from individuals and the food industry to the Senate Committee Inquiry and in documents from the food regulatory sector).

Analysis of websites showed most government health and education departments were using the ADGs to inform a 'traffic light' approach to classifying foods supplied in school tuckshops /canteens, while Food Standards Australia New Zealand (FSANZ) focused on nutrient profiling approaches to define 'healthy' food and drinks for front of pack labelling, health claim and fortification initiatives.

The 20 published reviews differentiating between 'healthy' and 'unhealthy' food and drinks that were identified included a variety of terms: "discretionary food and drinks" or synonyms (6), "unhealthy" food and

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drinks (6), “energy-dense, nutrient-poor” foods (8), “non-core foods” (2), “junk food” (2), “ultra/processed foods” (2), and terms associated with various nutrient profiling schemes (5).[22] Three applied traffic light labelling systems, and another two focused on school nutrition policies that used either traffic light systems and/or “occasional” labels on ‘unhealthy’ food and drinks. There was general misalignment between nutrient profiling systems and the ADGs in several areas.

Analysis of 18 popular food and nutrition blogs found only about half the webpages reviewed aligned (broadly) with the ADGs recommendations. There was frequent use of terms to describe ‘healthy’ food and diets such as “gluten-free”, “dairy-free” and “Paleo” that do not align with the terms, concepts or evidence base in the ADGs.

Overall, the review found evidence of low rates of understanding of the definition, intent and application of the term ‘discretionary food and drinks’ as outlined in the ADGs. The results of Phase One suggest that greater clarity and consistency around the term ‘discretionary food and drinks’ could help reduce the high degree of misunderstanding, misinterpretation and misuse of the term, synonyms and relevant concepts.

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[22] All five applied to food labelling initiatives.

5.4. Part C: Potential fit-for-purpose definition/s of ‘unhealthy’ food (and synonyms) and food classification systems for different applications

5.4.1. Alignment of desired and potential attributes of systems of ‘unhealthy’ food definitions for different policy applications

The desired attributes of food definition systems for each of the food policy applications in the NOURISHING (plus) framework are included in Table 12. Several attributes were not applicable to specific food classification systems; for example, where the policy action concerned the provision of nutrition content information in nutrition information panels on food labels, addressed issues such as portion size, or focused on the channel, mode or how an intervention is conducted, rather than the food type concerned. For each potential policy application the number of desired attributes ranged from 0 to 12.

The attributes of current ‘unhealthy’ food definition systems identified from the results of the systematic literature review are presented in Table 13. The codes for each food classification system align with the taxonomy provided in Table 5. The evidence presented in the report of Phase One of this project [4] was also incorporated in Table 13 under code UB4 (‘discretionary’ as defined by NHMRC ADGs or other similar national dietary guidelines).

Consideration was also given to the effect of any limitations of the methodology on identification of the attributes of all definitions and food classification systems (see section 6.1.2). The major limitation affecting results was the inherent publishing delay associated with systematic review of peer-reviewed reviews; this meant that any relevant evidence from more recent single studies may not have been included in results. The risk of potential bias was highest for exclusion of any recent single studies on any emerging classification system, particularly evaluations. The major food classification system affected by this limitation was the NOVA classification using the “ultra-processed foods” definition, which had been assessed in process, impact and outcome evaluations mostly from early 2019. The results of these studies are captured in Table 13 under code UC1 by inclusion of upper values to provide a potential range of scores for each attribute. The affected fields were colour coded as per other systems on the lower score, but a deeper shade of colour was used to reflect transparently the uncertainty around the minimum values allocated and the different method used to identify attributes of that system compared to others.

For completeness, the attributes of current ‘healthy’ food definition systems identified from the results of the systematic literature review are presented in Table 14.

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Table 12. Desired attributes of food definition systems suitable for each of the food policy applications in the NOURISHING (plus) framework

Domain of potential food policy application Examples of types of actions	**Potential attributes of an unhealthy/healthy food definition system #**													
	All foods in diet focus	**Food focus**	**Nutrient focus**	**Drinks only**	**Includes 'unhealthy' term**	**Healthy def'n is inverse**	**Agreed def'ns**	**Def'n agreement across cat's**	**Def'n agreement within cat's**	**Nutrient cut-offs**	**Evaluation of classification system Scope of assessment for process; impact; outcome**	**Strengths in practice**	**Limitations in practice**	**Comment Gold standard or best practice example ***
N: Nutrition label standards and regulations on the use of claims and implied claims on food														
Mandatory nutrient lists on packaged food	X		X		N/A	N/A	N/A	N/A	N/A	N/A	Nutrient lists are: understood, mandated, applied; lead to product reformulation and healthier purchases, lead to healthier diets and improved health outcomes	Transparent Verifiable Provides citizens with information required to make informed choice Applies across food categories	NIP poorly understood by all citizens Doesn't take account of effect of food matrix or other qualities	N/A: Information system, not a food classification system Example of best practice: USA (NIP provides data for a range of nutrients to enable assessment of the 'healthiness' of the food against all the nutrients mentioned in national dietary guidelines recommendations (including 'added sugar' and 'trans fat'))
Clearly visible "interpretative" labels	X	X Both	X Both			N/A			X	X	Interpretive labels are: understood, mandated, applied; lead to product reformulation and lead to healthier purchases, lead to healthier diets and improved health outcomes	Some systems transparent Verifiable if transparent Provides citizens with information required to make informed choice Supports product reformulation Systems supporting promotion of 'healthy' choices most supported by industry groups	Range of systems used globally, with different nutrients, criteria and cut-points applied Highly arbitrary Not all transparent Doesn't take account of effect of food matrix or other food attributes Not always consistent with intent of national dietary guidelines Some models suffer perceived credibility issues among some consumer and public health commentators Some systems contain potential loop holes Identifies healthier choices, not healthiest choices, so may not lead to healthier diets Product reformulation doesn't always lead to healthier food supply- tends to work best for sodium, and to a lesser extent for added sugar, and relatively poorly for fat Usually voluntary Doesn't apply across food categories	Example of best practice: Application of warning labels to denote 'unhealthy' choices and augment other more 'relative' systems. The European Nutri-score system and the UK traffic light labelling systems are most frequently cited and supported Stakeholders with vested interests should not be involved in policy setting (happens in only 4 out of 27 countries) Once all stakeholders agree on all metrics and criteria, the system should be mandatory
Clearly visible warning labels	X	X			X	N/A	X Unhealthy	X	X	X	Clearly visible warning labels are: understood, mandated, applied; lead to reduced purchases unhealthy food; lead to	Most are transparent Verifiable, if transparent	Range of systems used globally Different cut-points used, if applied Not all transparent	Example of best practice: Brazil and Chile warning labels

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Domain of potential food policy application Examples of types of actions	Potential attributes of an unhealthy/healthy food definition system #													
	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Evaluation of classification system Scope of assessment for process; impact; outcome	Strengths in practice	Limitations in practice	Comment Gold standard or best practice example *
											healthier diets and improved health	Provides citizens with clear information on choices to avoid May support product reformulation Supported generally by public health and consumer groups	Doesn't always take account of effect of food matrix or other food attributes Not supported by industry groups generally	
On-shelf labelling	X	X			X		X	X	X	X Often	On shelf labelling is: understood, mandated, applied; lead to healthier purchases; lead to healthier diets and improved health	Transparent Verifiable Provides citizens with information required to make informed choice	Placement requires constant checking by informed staff or nutritionists Different cut-points used Not all transparent Doesn't always take account of effect of food matrix or other qualities Not always consistent with national dietary guidelines	Tends to combine food-and nutrient-based systems Best practice: some smaller remote stores, e.g. Jimmy Liddle thumbs up system in remote Aboriginal communities; adapted for use in some remote schools in Australia
Calorie & nutrient labelling on menus and displays in out-of-home venues			X		N/A	N/A	N/A	N/A	N/A	N/A	Labels are: understood with mandatory uptake; lead to healthier purchases, lead to healthier diets and improved health	Transparent Verifiable Provides citizens with information required to make informed choice Applies across food categories	Values may be poorly understood by all citizens Doesn't take account of effect of food matrix or other food attributes Only applies to food consumed out of home Comparator quantities may not be appropriate for all age/genders and other groups	N/A: Information system, not food classification system Example of best practice: Australian system displays energy content only
Warning labels on menus and displays in out-of-home venues		X			X	N/A	X	X	X	X	Clearly visible warning labels are: understood, mandated, applied; lead to reduced purchases unhealthy food; lead to healthier diets and improved health	Most are transparent Verifiable, if transparent Provides citizens with clear information on choices to avoid May support product reformulation Supported generally by public health and consumer groups	Uncommon Range of systems used globally Different cut-points used, if applied Not all transparent Doesn't always take account of effect of food matrix or other food attributes Not supported by industry groups generally	Showing promise in recent evaluations in Chile and Brazil
Rules on nutrient claims (ie nutrient content)	X		X				X			X	Rules are: understood, mandated, applied; lead to healthier purchases; lead to improved diet and health outcomes	Most are transparent Verifiable, if transparent May support product reformulation Systems supporting promotion of 'healthy' choices most	Range of systems used globally Different cut-points used, if applied Not all transparent Doesn't always take account of effect of food	More easily verifiable than health claims; used wisely

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Domain of potential food policy application Examples of types of actions	Potential attributes of an unhealthy/healthy food definition system #													
	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Evaluation of classification system Scope of assessment for process; impact; outcome	Strengths in practice	Limitations in practice	Comment Gold standard or best practice example *
												supported by industry groups	matrix or other food attributes May not lead to healthier diets, overall or improve health	
Rules on health claims (ie disease risk reduction claims)	X	X	X				X			X	Rules are: understood, mandated, applied; lead to healthier purchases; lead to improved diet and health outcomes	Some are transparent Verifiable, if transparent Systems supporting promotion of 'healthy' choices most supported by industry groups	Range of systems used globally Claims may not be easily verifiable (need to check websites) Not all foods carrying health claims are consistent with dietary guidelines as some underscored by nutrient-based system, rather than evidence of food, diet, health relationships Different cut-points used, if applied Not all transparent Doesn't always take account of effect of food matrix or other food attributes May not lead to healthier diets overall or improve health	Different systems in place globally; few evaluations published- may 'health wash' product for marketing purposes
O: Offer healthy food and set standards in public institutions and other specific settings														
Fruit & vegetable initiatives in schools		X			N/A	N/A	X Fresh fruit and veg	N/A			Fruit and veg are: supplied with good uptake; increase fruit and veg purchases, lead to healthier diets and improved health	Relatively clear message and policy action	Confusion about inclusion of juices and other processed fruit and veg products Doesn't address whole diet	Crunch and Sip in Australia, often cited as a good practice example
Standards for food available in schools, including restrictions on unhealthy food	X	X Both	X Both		X	X	X	X	X	X	Unhealthy choices are not supplied. Healthier and healthy foods are: supplied with good uptake; lead to healthier purchases, lead to healthier diets and improved health	Some systems transparent Verifiable High levels of mandatory application Provides healthier choices Avoids unhealthy choices Supports product reformulation	Range of systems used globally-different nutrient, criteria and cut-points applied- highly arbitrary and not all transparent Doesn't always take account of effect of food matrix or other food attributes Not always consistent with national dietary guidelines Some models suffer perceived credibility issues among some consumer and public health commentators	Best practice: Would be the Australian colour-coded system, but now there are several variations in systems across jurisdictions Tend to use a combination of food-based and nutrient-based approaches Process evaluations positive Supported by some available impact evaluations in school setting, but few impact evaluations at level of whole diet No evaluations at outcome level

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Domain of potential food policy application Examples of types of actions	Potential attributes of an unhealthy/healthy food definition system #													
	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Evaluation of classification system Scope of assessment for process; impact; outcome	Strengths in practice	Limitations in practice	Comment Gold standard or best practice example *
													Some systems contain potential loop holes Systems don't always identify healthiest choices, but rather healthier choices Product reformulation doesn't always lead to healthier food supply- tends to work best for sodium, to a lesser extent for added sugar, and relatively poorly for fat Doesn't always apply across food categories Limited to dietary intake in school setting, not whole diet	
Bans specific vending machines in schools														N/A to this project. Focuses on removal of food display cabinet rather than specific food classification system
Standards in social support programmes	X	X Both	X Both		X		X	X			Unhealthy choices are not supported Healthier and healthy foods are: supported with good uptake; lead to healthier purchases, lead to healthier diets and improved health	Some systems transparent Verifiable High levels of mandatory application Provides healthier choices Avoids unhealthy choices	Range of systems used globally- tend to be food-based, but sometimes nutrient, criteria and cut-points applied- arbitrary and not all are transparent Doesn't always take account of effect of food matrix or other qualities Not always consistent with national dietary guidelines Some models suffer perceived credibility issues among some consumer and public health commentators Some systems contain potential loop holes	USA- SNAP program, especially considering recent changes to focus more on food quality USA-WIC program
Standards in other specific locations (e.g. health facilities, workplace)	X	X Both	X Both		X	X	X	X	X	X	Unhealthy choices are not supplied. Healthier and healthy foods are: supplied with good uptake; lead to healthier purchases, lead to healthier diets and improved health	Some systems transparent Verifiable High levels of mandatory application Provides healthier choices Avoids unhealthy choices Supports product reformulation	Range of systems used globally-different nutrient, criteria and cut-points applied- highly arbitrary and not all transparent Doesn't always take account of effect of food matrix or other qualities Not always consistent with national dietary guidelines Some models suffer perceived credibility issues	Best practice: Would be the Australian colour-coded system, however there are now some variations in systems across jurisdictions Tend to use a combination of food-based and nutrient-based approaches Process evaluations positive Supported by some available impact evaluations in health setting, but few impact evaluations at level of whole diet; No evaluations at outcome level

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													among some consumer and public health commentators Some systems contain potential loop holes Systems don't always identify healthiest choices, but rather healthier choices Product reformulation doesn't always lead to healthier food supply- tends to work best for sodium, to a lesser extent for added sugar, and relatively poorly for fat Doesn't always apply across food categories Limited to dietary intake in health or other setting, not whole diet	
U: Use economic tools to address food affordability and purchase incentives														
Health-related food taxes	X	X			X		X	X	X	X	Health-related food taxes are: Accepted by public and industry; lead to healthier purchases, reduce unhealthier purchases; lead to healthier diets and improved health	Addresses key determinant of dietary choice- price and affordability Revenue-generating- can be hypothecated Clear application in SSBs Supported generally by public health and consumer groups	Variation in foods included and nutrient cut-points applied. Generally not supported by food industry groups.	Best practice: GST (10%) differentially applied in Australia Tax (≥20%) on SSBs in 38 countries Positive evaluations available at process, impact and outcome level- strong evidence base Not regressive as evidence that those who benefit most are that who are most affected by poor diet
Increasing import tariffs on specified "unhealthy" food	X	X			X		X				Health-related food tariffs are: accepted by public and industry; lead to healthier purchases, reduce unhealthier purchases; lead to healthier diets and improved health	Addresses key determinant of dietary choice- price and affordability Revenue-generating	Variation in foods included	Focus on application, rather than differentiation of unhealthy and healthy food system; tends to be arbitrary- may be trade rather than health related
Lowering import tariffs on specified "healthy" food	X	X			X		X				Health-related food tariffs are: accepted by public and industry; lead to healthier purchases, reduce unhealthier purchases; lead to healthier diets and improved health	Addresses key determinant of dietary choice- price and affordability	Variation in foods included	Focus on application, rather than differentiation of unhealthy and healthy food system; tends to be arbitrary- may be trade rather than health related

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Domain of potential food policy application Examples of types of actions	Potential attributes of an unhealthy/healthy food definition system #													
	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Evaluation of classification system Scope of assessment for process; impact; outcome	Strengths in practice	Limitations in practice	Comment Gold standard or best practice example *
Targeted subsidies for healthy food	X	X			X		X	X	X	X	Health-related food subsidies are: accepted by public and industry; lead to healthier purchases, reduce unhealthier purchases; lead to healthier diets and improved health	Addresses key determinant of dietary choice- price and affordability Revenue-generating - can be hypothecated	Variation in foods included and nutrient cut-points applied.	Best practice: GST (10%) differentially applied in Australia Tax (≥20%) on SSBs in 38 countries Positive evaluations available at process, impact and outcome level- strong evidence base USA- SNAP and WIC programs- to be completed
R: Restrict food advertising and other forms of commercial promotion														
Mandatory regulation of broadcast food advertising to children	X	X			X	N/A	X			X May be required in some systems	Mandatory broadcasting advertising to children restrictions are: accepted by public and industry; reduce 'pester power'; lead to healthier purchases, reduce unhealthier purchases; lead to healthier diets and improved health	Protects children Reduces 'pester power' Good program logic	High variability in food classification systems applied Good evidence from process and impact evaluations Limited outcome evaluation Often only voluntary	UK- Ofcom model Canada-Quebec model
Mandatory regulation of food advertising on non-broadcast communications channels	X	X			X	N/A	X			X May be required in some systems	Mandatory (non-broadcasting) advertising to children restrictions are: accepted by public and industry; reduce 'pester power'; lead to healthier purchases, reduce unhealthier purchases; lead to healthier diets and improved health	Protects children Reduces 'pester power' Good program logic	High variability in food classification systems applied Less evidence than broadcasting due to relative lack of studies. Limited outcome evaluation Often only voluntary	Relatively new area of activity
Mandatory regulation of food advertising through any medium	X	X			X	N/A	X			X May be required in some systems	Mandatory advertising restrictions are: accepted by public and industry; lead to healthier purchases, reduce unhealthier purchases; lead to healthier diets and improved health	Excellent program logic that comprehensive policy action is required	Not implemented currently	
Mandatory regulation of specific marketing techniques														N/A - policy action focuses on process rather than content
Mandatory regulation of marketing of specific food items and beverages	X	X			X	N/A	X				Mandatory advertising restrictions are: accepted by public and industry; lead to healthier purchases, reduce unhealthier purchases; lead to healthier diets and improved health	Excellent program logic that comprehensive policy action is required	Not implemented currently Requires specific list of included/excluded foods	

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Domain of potential food policy application Examples of types of actions	Potential attributes of an unhealthy/healthy food definition system #													
	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Evaluation of classification system Scope of assessment for process; impact; outcome	Strengths in practice	Limitations in practice	Comment Gold standard or best practice example *
Mandatory regulation of food marketing in schools														Repeats above categories with focus on school setting- repetitive. Not specific to any particular food classification system
Mandatory requirement that advertisements must carry a health message or warning														N/A- policy action focuses on process rather than content
I: Improve nutritional quality of the whole food supply														
Reformulation of food products	X		X					X	X	X	Reformulation is: accepted, widespread; lead to healthier overall diet; lead to health outcomes	Subliminal Small changes have potentially large impacts Process evaluations positive for some nutrients	Usually only voluntary Identifies healthier choices, not healthiest choices, so may not improve overall diet. Product reformulation doesn't always lead to healthier food supply- tends to work best for sodium, to a lesser extent for added sugar, and relatively poorly for fat Few impact evaluations available No outcome evaluations available	Best practice example: UK Result of process evaluation varies for different nutrients- good data for sodium Has been criticised for "fiddling around the edges" rather than supporting any transformational change in food system
Commitments to reduce portion sizes	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Reduced portion size is: accepted, widespread; lead to healthier overall diet; lead to health outcomes	Strong program logic	Little real-world evaluations available; most interventions conducted in controlled laboratory situation Need to consider increasing portion size of some healthy foods such as fruit and vegetables- but rarely considered in studies	No best practice example in real world available Deals with quantity not quality of the diet, but presumably could apply to increasing portion size of healthy foods and decreasing portion size of unhealthy foods.
Limits on level of salt in food products	X		X					X	X	X	Reformulation re salt reduction is: accepted, widespread; lead to healthier overall diet; lead to health outcomes specific to salt reduction	Subliminal Small changes have potentially large impacts Process evaluations positive for salt	Usually only voluntary Identifies healthier choices, not healthiest choices, so may not improve overall diet. Product reformulation tends to work best for sodium. Several impact evaluations available No direct outcome evaluations available, but good evidence from modelling	Repeats some of information above, with focus on salt specifically Best practice UK example
Limits on availability of certain "high in" foods														N/A as focuses on process of limiting availability, rather than food classification system applied. Similar to other nutrient profiling system applications

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Domain of potential food policy application Examples of types of actions	Potential attributes of an unhealthy/healthy food definition system #													
	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Evaluation of classification system Scope of assessment for process; impact; outcome	Strengths in practice	Limitations in practice	Comment Gold standard or best practice example *
S: Set incentives and rules to create a healthy retail and food service environment														
Incentives and rules for stores to locate in under-served neighbourhoods														Not relevant to current project; focuses on process, rather than quality of food supply or food classification system
Initiatives to increase the availability of healthier food in stores and food service outlets														Not relevant to current project; focuses on process, rather than quality of food supply or food classification system. To be completed
Incentives and rules to reduce trans fat in food service outlets														Not relevant to current project; focuses on one (negative) nutrient rather than the food classification system or quality of food supply
Incentives and rules to offer healthy food options as a default in food service outlets														Not relevant to current project; focuses on process, rather than quality of food supply or food classification system. To be completed
Incentives and rules to restrict SSB consumption in food service outlets				X										Not relevant to current project; focuses on process, rather than quality of food supply or food classification system. To be completed – also deals with drink only definitions not relevant to this project
Incentives and rules to reduce salt in food service outlets														Not relevant to current project; focuses on process and one (negative) nutrient rather than the food classification system or quality of food supply
Planning restrictions on food outlets														Not relevant to current project; focuses on process, rather than quality of food supply or food classification system. To be completed
H: Harness food supply chain and actions across sectors to ensure coherence with health														
Working with food suppliers to provide healthier ingredients														Not relevant to this project, as healthier 'ingredients' is a non-specific term Reflects whole food system so likely to refer to different food classifications for different applications
Nutrition standards for public procurement	X	X Both	X Both		X	X	X	X	X	X	Presume unhealthy choices are not supplied. Presume healthier and healthy foods are: supplied with good uptake; lead to healthier purchases, lead to healthier diets and improved health	Some systems transparent Verifiable High levels of mandatory application Provides healthier choices Avoids unhealthy choices Supports product reformulation	Policy area lacks detail; presume applies to both restriction of unhealthy items and provision of healthy and healthier items Range of systems used globally- different nutrient, criteria and cut-points applied- highly arbitrary and not all transparent Doesn't always take account of effect of food matrix or other qualities Not always consistent with national dietary guidelines	Best practice: Could be the Australian colour-coded system in health care setting (some variations in systems across jurisdictions) Tend to use a combination of food-based and nutrient-based approaches Process evaluations positive Supported by some available impact evaluations in school setting, but few impact evaluations at level of whole diet; No evaluations at outcome level

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Domain of potential food policy application Examples of types of actions	Potential attributes of an unhealthy/healthy food definition system #													
	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Evaluation of classification system Scope of assessment for process; impact; outcome	Strengths in practice	Limitations in practice	Comment Gold standard or best practice example *
													Some models suffer perceived credibility issues among some consumer and public health commentators Some systems contain potential loop holes Systems don't always identify healthiest choices, but rather healthier choices Doesn't always apply across food categories Limited to dietary intake in procurement setting, not whole diet	
Public procurement through "short" chains (e.g. local farmers)														Not relevant to current project; focuses on process and/or quantity of food supply, rather than quality of food supply
Supply chain incentives for food production														Not relevant to current project; focuses on process and/or quantity of food supply, rather than quality of food supply
Supporting urban agriculture in health and planning policies														Not relevant to current project; focuses on process and/or quantity of food supply, rather than quality of food supply
I(2): Inform people about food and nutrition through public awareness														
Development and communication of food-based dietary guidelines	X	X			X	X	X	X	X		Dietary guidelines are: Evidence-based (systematic literature reviews of food, diet, health relationships); transparent; accepted, widely promoted; lead to healthier overall diet; lead to health outcomes	Strong evidence base re food, diet and health relationships Aspirational Applies to all sectors of the population Considers food matrix and other food attributes Clearly identifies healthy foods to eat more of, and unhealthy food to eat less of, on the basis of risk of consumption with health outcomes Supports modelling of whole diet Can be represented pictorially in food guides	Qualitative, rather than quantitative Not all based on systematic reviews Publication and promotion varies widely Not all incorporate equity or environmental sustainability considerations Not all updated regularly (5 years suggested by WHO) Not all concepts are used as intended Can only reflect evidence in available studies at time of review Less clear in classification of 'grey' areas, which can lead to inclusion of arbitrary nutrient cut-points	Best practice examples: USA, Canada, Australia, UK Continual evidence update and refinement process being adopted in some countries
Development and communication of guidelines for specific food groups		X			X	X	X	X	X		Food group based Guidelines are: Evidence-based (systematic literature reviews of food, diet,	Strong evidence base re food, health relationships Aspirational	Qualitative, rather than quantitative Not all based on systematic reviews	As above including estimates of quantitative exposure effects for each food group

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											health relationships); transparent; accepted, widely promoted; lead to healthier overall diet; lead to health outcomes	Applies to all sectors of the population Considers food matrix and other food attributes Clearly identifies healthy foods to eat more of, and unhealthy food to eat less of, on the basis of risk of consumption with health outcomes Supports modelling of whole diet Can be represented pictorially in food guides	Publication and promotion varies widely Not all incorporate equity or environmental sustainability considerations Not all updated regularly (5 years suggested by WHO) Not all concepts are used as intended Can only reflect evidence in available studies at time of review Less clear in classification of 'grey' areas, which can lead to inclusion of arbitrary nutrient cut-points	
Public awareness, mass media and social marketing on healthy eating	X	X			X	X	X	X	X		Healthy foods promoted reflect dietary guidelines. Evidence-based (systematic literature reviews of food, diet, health relationships); transparent; accepted, widely promoted; lead to healthier overall diet; lead to health outcomes	Strong evidence base re food, diet and health relationships Aspirational Applies to all sectors of the population Considers food matrix and other food attributes Clearly identifies healthy foods to eat more of, and unhealthy food to eat less of, on the basis of risk of consumption with health outcomes Supports modelling of whole diet Can be represented pictorially in food guides	Qualitative, rather than quantitative Strategy, channel, targeting varies widely Not all incorporate equity or environmental sustainability considerations Not all concepts are used as intended Can only reflect evidence in available studies at time of review Less clear in classification of 'grey' areas, which can lead to inclusion of arbitrary nutrient cut-points	Public awareness programs are usually based on promotion of specific food groups (e.g. fruit and vegetable consumption) as people chose foods to eat (not nutrients) and consistent with national dietary guidelines. Tend to be food-based as need to be transparent, accepted, non-controversial
N(2): Nutrition advice and counselling in healthcare settings														
Guidelines and programmes to provide support in primary care to people who are overweight and obese														Strong clinical components; not as relevant to current project as other applications. As obesity is pervasive in western society has become norm- usually National dietary guidelines frame relevant advice
Nutrition counselling in primary care														Strong clinical components; not as relevant to current project as other applications.
Training for health professionals														May include clinical components; not as relevant to current project as other

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	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Evaluation of classification system Scope of assessment for process; impact; outcome	Strengths in practice	Limitations in practice	Comment Gold standard or best practice example *
														applications. Training would be expected to cover all food classification systems and applications.
G: Give nutrition education and skills														
Nutrition education on curricula														Strong clinical components; not as relevant to current project as other applications. Training would be expected to cover all food classification systems and applications.
Community-based nutrition education	X	X			X	X	X	X	X		Healthy foods promoted reflect dietary guidelines. Evidence-based (systematic literature reviews of food, diet, health relationships); transparent; accepted, widely promoted; lead to healthier overall diet; lead to health outcomes	Strong evidence base re food, diet and health relationships Aspirational Applies to all sectors of the population Considers food matrix and other food attributes Clearly identifies healthy foods to eat more of, and unhealthy food to eat less of, on the basis of risk of consumption with health outcomes Supports modelling of whole diet Can be represented pictorially in food guides	Qualitative, rather than quantitative Strategy, channel, targeting varies widely Not all incorporate equity or environmental sustainability considerations Not all concepts are used as intended Can only reflect evidence in available studies at time of review Less clear in classification of 'grey' areas, which can lead to inclusion of arbitrary nutrient cut-points	Public awareness programs are usually based on promotion of specific food groups (e.g. fruit and vegetable consumption) as people chose foods to eat (not nutrients) and are consistent with national dietary guidelines. Tend to be food-based as need to be transparent, accepted, non-controversial. However, community based education may be expected to cover all food classification systems and applications. Simplicity and lack of controversy key
Cooking skills														Not relevant to current project; focuses on process and/or quantity of food supply, rather than quality of food supply
Initiatives to train school children on growing food														Not relevant to current project; focuses on process and/or quantity and/or specific food groups (i.e. fruit and vegetables) in food supply, rather than quality of food supply
Training for chefs, caterers and food service providers														Training would be expected to cover all food classification systems and applications.
M&S: Monitoring and surveillance of nutrition actions														
Monitoring and surveillance of dietary intake														Monitoring and surveillance system would be expected to support data required in all food classification systems and applications.
Monitoring and surveillance of diet-related health outcomes														Monitoring and surveillance system would be expected to support data required in all food classification systems and applications.

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	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Evaluation of classification system Scope of assessment for process; impact; outcome	Strengths in practice	Limitations in practice	Comment Gold standard or best practice example *
Monitoring and surveillance of food environments														Choice of food classification system would likely vary to suit different food environment and/or policy application.
Monitoring and surveillance of nutrition policy actions														Choice of food classification system would likely vary to suit different food environment and/or policy application.

* Further examples on WCRF NOURISHING database website at: https://www.wcrf.org/int/policy/nourishing-database

Key to abbreviated column headings

Column heading	Explanation
All foods in diet focus	The definition has a focus on all foods in the diet
Food focus	The definition focuses on food, rather than nutrients
Nutrient focus	The definition focuses on nutrients, rather than food
Drinks only	The definition applies to drinks only
Includes 'unhealthy' term	The definition includes a specific term for 'unhealthy' food and drinks
Healthy def'n is inverse	The definition is such that 'healthy' food can be defined as the inverse of 'unhealthy' food
Agreed def'ns	There is wide agreement of the definition of unhealthy (and healthy) food or drinks
Def'n agreement across cat's	There is agreement of the definition of less healthier (and healthier) *across* food categories
Def'n agreement within cat's	There is agreement of the definition of less healthier (and healthier) *within* food categories
Nutrient cut-offs	The definition includes or refers to specific nutrient (or food component) cut-off points

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Table 13. Attributes of 'unhealthy' food definition systems

Unhealthy foods and/or drinks and synonyms Category and terms	Appli-cation Reviews (Int w/s) (Nat w/s)	N reviews (websites) incl. term	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Available evaluation of classification system Process	Impact	Outcomes	Comment Gold standard? Strengths Limitations
Descriptive synonyms																
UA1 Nutrient-poor and/or energy-dense Low in positive nutrients	NOURI(2) SH (Int -OR)	7 (Int 2)	X		X		X	X								Definition lack clarity- appears arbitrary No gold standard Recognition of need for standardised definition lead to development of nutrient profiling systems
UA2 High in negative nutrients e.g. high fat, high sat fat, high sugar	NOURI(2) SHIG (Int - NORISHI(2)GM&S) (Nat -O)	14 (Int 7) (Nat 4- all school food policies)	X		X		X	X								Definition lack clarity- appears arbitrary No gold standard Recognition of need for standardised definition lead to development of nutrient profiling systems
UA3 Multiple definitions	OURISH (Nat - OURS)	4 (Nat 6)	X	X mostly	X		"Unhealthy food"	complex					Compliance evaluation New York	Shangguan meta-analysis of any labelling - showed industry reformulation and consumers decreased purchases of unhealthy foods		Definition lack clarity- appears arbitrary No gold standard
UA4 Food examples	NOURISM&S (Int - IN(2)I(2)) (Nat - OURIS)	5 (Int 6) (Nat 9)	X	X			"Unhealthy food"						Compliance evaluation in Slovenia Compliance implementation evaluation of SNAP			Definition lack clarity- food lists are arbitrary commonly including fast food, SSB, high fat foods, processed snacks, fried foods, salty snack plus other qualifiers Huang notes "Complexities in defining an categorising healthy or unhealthy food… suggests category and nutrient based approach is feasible option"

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Unhealthy foods and/or drinks and synonyms Category and terms	Appli-cation Reviews (Int w/s) (Nat w/s)	N reviews (websites) incl. term	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Available evaluation of classification system			Comment Gold standard? Strengths Limitations
													Process	Impact	Outcomes	
																2 potential COI with industry funding
UA5 Inverse of "nutritious"/"healthy" e.g. "competitive"	NOURISH (Int- SO) (Nat-NUIR)	7 (Int 1) (Nat 1)	X	X	X (Foods minimal nutritional value)		"Unhealthy foods" "Inverse of ability to carry healthy claims"							Some cross-sectional studies (so no inference of causality can be drawn)		Definition lack clarity
Discretionary																
UB1 Energy-dense (empty calorie), nutrient-poor	UI	1	X	X			X	X (core)						Modelling shows food-based approach improves diet		Arbitrary definition
UB2 Reference to ADG (or other DGs) but appears to be a non-standard definition	NOURI(2) GM&S	3	X	X												Arbitrary definition Acknowledges lack of consensus on definitions (International Choices Program- logo) - however potential COI with consultant for food companies- now discontinued in 2 countries
UB3 Discretionary energy/calories/kJ	OI(2)	2	X	X	X											Different conceptually - individually focused around choice modelling- for SNAP. Similar to foundation and total diet modelling for ADGs
UB4 As per NHMRC (or other DGs) definition	NOURISHING M&S	None	X	X			X	X	X				X	X	X	Strong food base Gold standard USA, Canada, UK, Australia – strong evidence base systematic reviews of evaluations including health outcomes Other countries eg Brazil use strong good practice points and expert consensus.

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Unhealthy foods and/or drinks and synonyms Category and terms	Appli-cation Reviews (Int w/s) (Nat w/s)	N reviews (websites) incl. term	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Available evaluation of classification system Process	 Impact	 Outcomes	Comment Gold standard? Strengths Limitations
Ultra-processed / Processed																
UC1 Ultra processed/ NOVA classification	URIH1(2) H	4 (Nat 2)	X	X	X (early websites)		X	X (whole food)	(No-NOVA system emerging)	X	X					Conceptually different than other classification systems - focus on degree of processing rather than the foods themselves- "Seems to be little advantage from use of NOVA classification compared with the current epidemiological approach which relies on linkage of nutrient intakes to chronic disease…" Food industry generally not supportive of classification system based on processing. Potential COI with on author on Huang food industry and pharma funding. NOVA system initiated and promoted in Brazil
UC2 Highly processed/ processed but no definition provided	O OHI(2)	1 (Nat 5)	X	X	(energy density only)		X									Potential COI in peer reviewed review Position statement of Council on School Health USA Brazil website
UC3 Packaged foods	NOURSN(2)	2	X	X	X											Definition lacks clarity
UC4 Processing not specified (really nutrient density)	N (Int -II(2)) (Nat -O)	1 (Int 1) (Nat 1)	X	X	X		X									Definition lacks clarity Strong focus on salt
Nutrient profiling																
UD1 Nutrient-poor foods; no mention of profiling system or cut offs provided. Also "not eligible for health claim"	NOU	1	X		X		X	X								Definition lacks clarity or transparency

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Unhealthy foods and/or drinks and synonyms Category and terms	Appli-cation Reviews (Int w/s) (Nat w/s)	N reviews (websites) incl. term	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Available evaluation of classification system			Comment Gold standard? Strengths Limitations
													Process	Impact	Outcomes	
UD2 Nutrient cut–offs provided	NIRM&S (Int -OS) (Nat - RONH; vast majority food labelling)	1 (Int 1) (Nat 20)	X		X		Chile- uses stop sign Finland uses high salt content warning label			Nutri-score uses 5 colours from dark green to dark orange	X	X	X (UK traffic light system)	X (UK traffic light system) impact on consumer food purchases		Some inconsistency of nutrients considered, greater inconsistency of cut-offs applied. Lobstein 2009: "Healthier does not necessarily mean healthy per se; notions of what's better than may lead consumers away from what is best" Lobstein 2009: recommends UK Ofcom model for advertising and UK traffic light system for food labelling as easiest way to explain to consumers - and incentive for reformulation. Two other systems limited to sodium; one just referred to energy Nutri-score used in Belgium, France and Switzerland
UD3 Refers to nutrient profiling system, but specific details not provided	O (Nat- NO)	1 (Nat 4)	X		X		"Red", "sometimes food", "low star", "least healthy"	X (logos			X		Process evaluations: -HSR (uptake by industry) in Australia - Reformu-lation in NZ -Consumer motives in Netherlands			Def'n lacks clarity- doesn't really reflect actual NSW school policy (?misquoted in review) International choices Program - potential COI (no longer supported in Netherlands or Belgium)
UD4 Reviews nutrient profiling systems (discusses healthier vs healthy foods)	NOURSHI (2)M&S	6 (Int 0) (Nat 0)	X		X						X (generally)	X	Less than 42% considered awareness or understanding- only 10% of these showed improved uptake	Very limited	None	Disagreement among reviews. No clear definition as reviews covered a number of different combinations of food categories, nutrients and food components that could potentially be used. In Labonte two authors have food industry links and potential COI. Consensus that more consultation, research and evaluations needed.

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Unhealthy foods and/or drinks and synonyms Category and terms	Appli-cation Reviews (Int w/s) (Nat w/s)	N reviews (websites) incl. term	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Available evaluation of classification system Process	Impact	Outcomes	Comment Gold standard? Strengths Limitations
Other – food habit focussed																
UE1 Fast food	N2	1 (Int 1)		X			Fast food (various qualities)									Definition lacks clarity
UE2 Out-of-home eating	OSM&S (Nat - N)	1 (Nat 1)		X			Vague									Definition lacks clarity and is restrictive (e.g. includes 'take aways' but not ready prepared foods) New York City w/s mentions out of home foods high in sodium only
UE3 Ready-to-eat meals/prepared foods	NSI(2)	2		X			Vague									Acknowledges lack of consensus on definitions
UE4 Snacks	OIHI(2)N(2) (Nat – OS) (Int – I(2))	4 (Int 1) (Nat 1)		X	X		Food eaten between meals									Acknowledges lack of consensus on definitions Food service focus
Other – Sugar and sugar-sweetened beverages																
UF1 Added sugar	NUII(2) (Nat – OU)	7 (Nat 2)	X		X		Red label – not schools in Israel									Varied definitions Deals with specific issues re sugar in processing
UF2 Free sugars	NINI2 (Int – NOURISHING)	5 (Int'l 2)			X					X	X (WHO def'n)					Those with COI state lack of consensus on definitions
UF3 High sugar foods	U (Nat – S)	1 (Nat 1)			X									X fiscal		Definition lacks clarity Mentions both foods and drinks
UF4 Sugar sweetened beverages, energy drinks, fruit juices	NOURISING (Int - UI2M&S) (Nat – OUIS)	18 (Int 4) (Nat 11)				X	X	X		X	X					Some differences re fruit juice, energy drinks, importance of fructose, and quantity 2 COI (1 on board of Dunkin Donuts) says no evidence to focus on just one nutrient

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Unhealthy foods and/or drinks and synonyms Category and terms	Appli-cation Reviews (Int w/s) (Nat w/s)	N reviews (websites) incl. term	All foods in diet focus	Food focus	Nutrient focus	Drinks only	Includes 'unhealthy' term	Healthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Available evaluation of classification system			Comment Gold standard? Strengths Limitations
													Process	Impact	Outcomes	
																1 COI (pharma) calls for focus on other foods
UF5 Artificially sweetened beverages	I	1				X	X				X					
Other – food-based dietary guidelines																
UG1 Food-based only		None														
UG2 Food-based and only negative nutrients	Nat - Generally not specified. Some have OIN	(Nat 7)	X	X				X								
UG3 Food-based and only positive nutrients																
UG4 Food-based and positive and negative nutrients	(Nat – N)	(Nat 1)	X	X				X								
UG5 Nutrient-based only	None	(Nat 2)			X											

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Key to abbreviated column headings

Column heading	Explanation
All foods in diet focus	The definition has a focus on all foods in the diet
Food focus	The definition focuses on food, rather than nutrients
Nutrient focus	The definition focuses on nutrients, rather than food
Drinks only	The definition applies to drinks only
Includes 'unhealthy' term	The definition includes a specific term for 'unhealthy' food and drinks
Healthy def'n is inverse	The definition is such that 'healthy' food can be defined as the inverse of 'unhealthy' food
Agreed def'ns	There is wide agreement of the definition of unhealthy (and healthy) food or drinks

Def'n agreement across cat's	There is agreement of the definition of less healthier (and healthier) *across* food categories
Def'n agreement within cat's	There is agreement of the definition of less healthier (and healthier) *within* food categories
Nutrient cut-offs	The definition includes or refers to specific nutrient (or food component) cut-off points
Available evaluation of classification system	
Process	Evaluation measuring whether strategies are implemented as intended, e.g. change in uptake, awareness or understanding
Impact	Evaluation measuring change in diet
Outcomes	Evaluation measuring change in risk factors or health outcomes

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Table 14. Attributes of 'healthy' food definition systems

Healthy foods and/or drinks and synonyms Category and terms	**Application** Reviews (Int w/s) (Nat w/s)	**N reviews (websites) incl. term**	**All foods in diet focus** [3]	**Food focus**	**Nutrient focus**	**Drinks only**	**Includes 'healthy' term**	**Unhealthy def'n is inverse**	**Agreed def'ns**	**Def'n agreement across cat's**	**Def'n agreement within cat's**	**Nutrient cut-offs**	**Comment** **Gold standard?** **Strengths** **Limitations**
Descriptive synonyms													
HA1 Nutrient rich and/or low energy density High in positive nutrients	NURISHI(2)	6 (Int 2)	X		X		X	X					Definition lacks clarity; appears arbitrary No gold standard Recognition of need for standardised definition lead to development of nutrient profiling systems COI: Nicklas sponsored by dairy
HA2 Low in negative nutrients e.g. low fat, low sugar	U (Int M&S) (Nat OI)	1 (Int 3) (Nat 3)	X		X (Review -only low calorie and fat; websites cover more negative nutrients)		X						Definition lacks clarity; appears arbitrary No gold standard Recognition of need for standardised definition lead to development of nutrient profiling systems COI: Afsen – food and pharma funds
HA3 Multiple definitions	NOUIS (Int OSI(2)) (Nat O)	3 (Int 4) (Nat 6)	X	X (mostly)	X		"healthy food"	Complex					Definition lacks clarity; appears arbitrary Healthy foods described in a variety of ways, usually associated with the application. eg.' green foods' in NZ No gold standard
HA4 Food examples	NOURII(2)N(2) (Int I(2)) (Nat NOUIS)	6 (Int 3) (Nat 19)	X	X			"healthy";						Definition lacks clarity; food lists arbitrary; commonly include fruit, veg, lean meats, sugar-free beverages, seafood, low-fat dairy, wholegrains, beans and legumes but sometimes raw, fresh, etc. Healthy foods described in variety of ways, usually associated with the application eg "keyhole foods" for labelling; "authorised foods" for USA SNAP program; staple foods No gold standard
HA5 Inverse of "unhealthy"		0											

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Healthy foods and/or drinks and synonyms Category and terms	Application Reviews (Int w/s) (Nat w/s)	N reviews (websites) incl. term	All foods in diet focus [3]	Food focus	Nutrient focus	Drinks only	Includes 'healthy' term	Unhealthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Comment Gold standard? Strengths Limitations
Core / Food groups													
HB1 Nutrient rich and/or low energy density	NOURII(2)	6	X	X			X						Definition lacks clarity; appears arbitrary No gold standard
HB2 Reference to ADG (or other DG) but appears to be a non-standard definition	(Nat OUI)	0 (Nat 1)	X	X									Definition lacks clarity and is not consistent with that of the relevant country's dietary guidelines
HB3 Non-discretionary energy/calories/kJ		0											
HB4 As per NHMRC (or other DGs) definition	NORISM&S (Int OSI(2) N(2)G) (Nat O)	4 (Int 5) (Nat 3)	X	X			X	X	X (generally)	X (generally)	X (generally)		Definitions relate to national dietary guidelines. Traditional First Nations foods included in some examples Consumption associated with reduced risk of diet-related disease
Unprocessed/Minimally processed													
HC1 Minimally processed/unprocessed/ "natural" per NOVA classification	HURII(2) (Nat O)	3 (Nat 1)	X	X			X	X	NOVA system emerging	X	X		Conceptually different than other classification systems - focus on degree of processing rather than the foods themselves. Healthy foods described in a some different ways, including as 'whole foods' "Seems to be little advantage from use of NOVA classification compared with the current epidemiological approach which relies on linkage of nutrient intakes to chronic disease…" Generally not supported by food industry. Potential COI with on author on Huang food industry and pharma funding. NOVA system initiated and promoted in Brazil

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Healthy foods and/or drinks and synonyms Category and terms	Application Reviews (Int w/s) (Nat w/s)	N reviews (websites) incl. term	All foods in diet focus [3]	Food focus	Nutrient focus	Drinks only	Includes 'healthy' term	Unhealthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Comment Gold standard? Strengths Limitations
HC2 Minimally processed/unprocessed/ "natural" – but no definition provided	(Nat H)	0 (Nat 1)	X	X			X						Appears to be the NOVA system, but definitions not provided on webpage.
HC3 Unpackaged foods		None											
HC4 Processing not specified (really nutrient density)	O	1	X	X			X					X	Adaptation of NOVA system plus energy density level cut off and allows 100% unsweetened fruit juice for healthy vending machines in San Francisco Appears arbitrary
Nutrient profiling													
HD1 Nutrient rich foods; no mention of profiling system or cut-offs provided. Also "Health Claim eligible"	O	1			X		X	X			X		Applies FSANZ Nutrient profiling system for health claims- Aust and NZ
HD2 Nutrient cut–offs provided	NRM&S (Nat NOUI)	1 (Nat 8)			X		X	X		X	X	X	Keyhole labelling system- sometimes alternative 'green' label applied Various cut-points applied
HD3 Refers to nutrient profiling system, but specific details not provided	O (Nat ONII(2))	1 (Nat 10)	X		X						X		Mixes foods and nutrients; Identifies healthier foods within categories rather than healthy foods Applies different indicators of healthy foods, eg 'green', high number of health stars. Little transparency about criteria within categories or cut-points provided
HD4	NOURSI(2)M&S	3	X		X						X (generally)	X	Disagreement amongst reviews.

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Healthy foods and/or drinks and synonyms Category and terms	Application Reviews (Int w/s) (Nat w/s)	N reviews (websites) incl. term	All foods in diet focus [3]	Food focus	Nutrient focus	Drinks only	Includes 'healthy' term	Unhealthy def'n is inverse	Agreed def'ns	Def'n agreement across cat's	Def'n agreement within cat's	Nutrient cut-offs	Comment Gold standard? Strengths Limitations
Reviews nutrient profiling systems (discusses healthier vs healthy foods)													No clear definition as reviews covered a number of different combinations of food categories, nutrients and food components that could potentially be used. In Labonte two authors have food industry links and potential COI More research and evaluations needed.
Other – food habit focussed	*No reviews identified*												
Other – Reduced sugar													
HF1 Reduced added sugar		None											
HF4 Healthy drinks (meaning no added sugar)	(Nat O)	0 (Int 1) (Nat 4)			X	X						X	Multiple drink categories and sugar contents specified.

Key to abbreviated column headings

Column heading	Explanation
All foods in diet focus	The definition has a focus on all foods in the diet
Food focus	The definition focuses on food, rather than nutrients
Nutrient focus	The definition focuses on nutrients, rather than food
Drinks only	The definition applies to drinks only
Includes 'healthy' term	The definition includes a specific term for 'healthy' food and drinks
Unhealthy def'n is inverse	The definition is such that 'unhealthy' food can be defined as the inverse of 'healthy' food
Agreed def'ns	There is wide agreement of the definition of healthy (and unhealthy) food or drinks
Def'n agreement across cat's	There is agreement of the definition of healthier (and less healthier) *across* food categories
Def'n agreement within cat's	There is agreement of the definition of healthier (and less healthier) *within* food categories
Nutrient cut-offs	The definition includes or refers to specific nutrient (or food component) cut-off points

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Scores of alignment between the desired attributes of a system of 'unhealthy'/'healthy' food definition suitable for potential food policy applications in the NOURISHING (plus) framework with the current food definition systems are presented in Table 15. The colour coding system reflecting the degree (%) of alignment applied in Table 15 is included in Figure 3; green indicates high levels of alignment and amber indicates moderate levels of alignment. In several cases as highlighted in Table 15, no example was identified (NEI) for the application of a specific food classification system for a specific policy action.

Figure 3: Colour coding schema of alignment applied in Table 15

	1	2	3	4	5	6	7	8	9	10	11	12
5	20%	40%	60%	80%	100%							
6	17%	33%	50%	67%	83%	100%						
7	14%	29%	43%	57%	71%	86%	100%					
8	13%	25%	38%	50%	63%	75%	88%	100%				
9	11%	22%	33%	44%	56%	67%	78%	89%	100%			
10	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%		
11	9%	18%	27%	36%	45%	55%	64%	73%	82%	91%	100%	
12	8%	17%	25%	33%	42%	50%	58%	67%	75%	83%	92%	100%

The highest scoring 'unhealthy' food definitions and related food classification systems for each policy application (indicated by green and amber colour coding in Table 15) were deemed to be most promising fit-for-purpose definitions and classification systems for application in each setting and environment.

Across all applications, the four most promising definitions of 'unhealthy' food and food classification systems, in no particular order are:

- the relative definition of 'less healthy' food and drinks using various nutrient profiling systems (UD3 and UD4) especially where specific system-level nutrient cut-points are provided (UD2) across food categories as well as within food categories;
- "discretionary" definition of 'unhealthy' food and drinks as defined by the Australian Dietary Guidelines or similar (UB4);
- the "ultra-processed" definition of 'unhealthy foods' as defined by the NOVA classification system (UC1), and
- the application of multiple definitions of 'unhealthy' food and drinks, most commonly a mix of food-based dietary guidelines and a nutrient-profiling system (UA3).

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Table 15. Alignment of 'unhealthy' food definition systems with desired attributes of food definition systems for policy applications in the NOURISHING (plus) framework

	Domain of food policy application	*n* desired attributes	Food classification definition category (see Table 5 for interpretation of codes)																										
			UA1	UA2	UA3	UA4	UA5	UB1	UB2	UB3	UB4	UC1	UC2	UC3	UC4	UD1	UD2	UD3	UD4	UE1	UE2	UE3	UE4	UF1	UF2	UF3	UF4	UF5	UG2	UG4
N	Mandatory nutrient lists on packaged food	NA																												
	Clearly visible "interpretative" labels	8	2	2	NEI	3	3	NEI	2	NEI	5	NEI	NEI	3	3	2	7.5	4	5	NEI	NEI	1	NEI	2	2	NEI	1	NEI	2	2
	Clearly visible warning labels	10	2	2	NEI	4	3	NEI	2	NEI	6	4-7	NEI	2	3	2	6.5	4	4	NEI	NEI	1.5	NEI	2	2	NEI	3	NEI	2	2
	On-shelf labelling	10	2	2	NEI	4	3	NEI	2	NEI	6	4-7	NEI	2	3	2	6.5	4	4	NEI	NEI	1.5	NEI	2	2	NEI	3	NEI	2	2
	Calorie & nutrient labelling on menus and displays in out-of-home venues	NA																												
	Warning labels on menus and displays in out-of-home venues	9	1	1	NEI	3	2	NEI	1	NEI	6	4-7	NEI	1	2	1	3.5	3	3	NEI	NEI	1.5	NEI	1	2	NEI	3	NEI	1	1
	Rules on nutrient claims (ie nutrient content)	7	2	2	NEI	2	2	NEI	1	NEI	5	4-6	NEI	2	2	2	4	3	4	NEI	NEI	0	NEI	2	1	NEI	0	NEI	1	1
	Rules on health claims (ie disease risk reduction claims)	8	2	2	NEI	3	3	NEI	1	NEI	6	4-6	NEI	3	3	2	4	3	4	NEI	NEI	1	NEI	2	1	NEI	0	NEI	2	2
O	Fruit & vegetable initiatives in schools	5	0	0	1	2	1	NEI	1	2	5	NEI	1	1	1	0	2	1	1	NEI	1	NEI	1	0	0	NEI	0	NEI	1	NEI
	Standards for food available in schools, including restrictions on unhealthy food	12	4	4	6.5	4	4	NEI	2	3	8	NEI	4	3	4	3	7.5	6	5	NEI	1.5	NEI	3	3	3	NEI	4	NEI	3	NEI
	Bans specific to vending machines in schools	NA																												
	Standards in social support programmes	9	3	2	4.5	4	5	NEI	2	7	4	NEI	3	3	4	3	6.5	4	3	NEI	1.5	NEI	3	3	2		2	NEI	2	NEI
	Standards in other specific locations (eg health facilities, workplace)	12	4	4	6.5	4	4	NEI	2	3	8	NEI	4	3	4	3	7.5	6	5	NEI	1.5	NEI	3	3	3		4	NEI	3	NEI
U	Health-related food taxes	10	2	2	4.5	4	3	4	2	NEI	7	6-9	NEI	2	NEI	3	NEI	NEI	4	NEI	NEI	NEI	NEI	2	2	1	3	NEI		
	Increasing import tariffs on specified "unhealthy" food	NA																												
	Lowering import tariffs on specified "healthy" food	NA																												
	Targeted subsidies for healthy food	10	2	2	4.5	4	3	4	2	NEI	7	6-9	NEI	2	NEI	3	NEI	NEI	4	NEI	NEI	NEI	NEI	2	2	1	3	NEI	NEI	NEI
R	Mandatory regulation of broadcast food advertising to children	8	2	2	4.5	4	3	NEI	2	NEI	7	4-7	NEI	2	NEI	NEI	5.5	NEI	5	NEI	NEI	NEI	NEI	NEI	0	NEI	1	NEI	NEI	NEI
	Mandatory regulation of food advertising on non-broadcast communications channels	8	2	2	4.5	4	3	NEI	2	NEI	7	4-7	NEI	2	NEI	NEI	5.5	NEI	5	NEI	NEI	NEI	NEI	NEI	0	NEI	1	NEI	NEI	NEI
	Mandatory regulation of food advertising through any medium	8	2	2	4.5	4	3	NEI	2	NEI	7	4-7	NEI	2	NEI	NEI	5.5	NEI	5	NEI	NEI	NEI	NEI	NEI	0	NEI	1	NEI	NEI	NEI
	Mandatory regulation of specific marketing techniques	NA																												

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Domain of food policy application		*n* desired attri-butes	Food classification definition category (see Table 5 for interpretation of codes)																										
			UA1	UA2	UA3	UA4	UA5	UB1	UB2	UB3	UB4	UC1	UC2	UC3	UC4	UD1	UD2	UD3	UD4	UE1	UE2	UE3	UE4	UF1	UF2	UF3	UF4	UF5	UG2	UG4
	Mandatory regulation of marketing of specific food items and beverages	7	2	2	4.5	4	3	NEI	2	NEI	7	4-7	NEI	2	NEI	NEI	3.5	NEI	2	NEI	NEI	NEI	NEI	NEI	0	NEI	1	NEI	NEI	NEI
	Mandatory regulation of food marketing in schools	NA																												
	Mandatory requirement that advertisements must carry a health message or warning	NA																												
I	Reformulation of food products	8	NEI	2	3.5	2	2	2	NEI	NEI	4	4-7	NEI	NEI	2	2	7	4	5	NEI	NEI	NEI	1	2	3	NEI	2	1	1	NEI
I	Commitments to reduce portion sizes	5	NEI	1	3.5	3	3	3	NEI	NEI	5	2	NEI	NEI	2	3	4	2	2	NEI	NEI	NEI	1	1	0	NEI	0	0	2	NEI
I	Limits on level of salt in food products	8	NEI	2	3.5	2	2	2	NEI	NEI	4	4-7	NEI	NEI	2	2	7	4	5	NEI	NEI	NEI	1	2	3	NEI	2	1	1	NEI
I	Limits on availability of certain “high in” foods	NA																												
S	Incentives and rules for stores to locate in under-served neighbourhoods	NA																												
S	Initiatives to increase the availability of healthier food in stores and food service outlets	NA																												
S	Incentives and rules to reduce trans fat in food service outlets	NA																												
S	Incentives and rules to offer healthy food options as a default in food service outlets	NA																												
S	Incentives and rules to restrict SSB consumption in food service outlets	NA (SSB)																												
S	Incentives and rules to reduce salt in food service outlets	NA (salt)																												
S	Planning restrictions on food outlets	NA (whole menu)																												
H	Working with food suppliers to provide healthier ingredients	NA (non specific)																												
H	Nutrition standards for public procurement	12	4	4	6.5	NEI	4	NEI	NEI	NEI	8	7-10	4	NEI	NEI	NEI	7.5	NEI	NEI	NEI	NEI	NEI	3	NEI	3	NEI	4	NEI	NEI	NEI
H	Public procurement through “short” chains (eg local farmers)	NA																												
H	Supply chain incentives for food production	NA																												
H	Supporting urban agriculture in health and planning policies	NA																												
I (2)	Development and communication of food-based dietary guidelines	10	3	3	NEI	4	NEI	NEI	2	3	8	6-9	3	NEI	3	NEI	NEI	NEI	NEI	NEI	NEI	1.5	2	NEI	2	NEI	4	NEI	NEI	NEI

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	Domain of food policy application	*n* desired attri-butes	Food classification definition category (see Table 5 for interpretation of codes)																										
			UA1	UA2	UA3	UA4	UA5	UB1	UB2	UB3	UB4	UC1	UC2	UC3	UC4	UD1	UD2	UD3	UD4	UE1	UE2	UE3	UE4	UF1	UF2	UF3	UF4	UF5	UG2	UG4
	Development and communication of guidelines for specific food groups	9	2	2	NEI	3	NEI	NEI	1	2	7	5-8	2	NEI	2	NEI	NEI	NEI	NEI	NEI	NEI	1.5	2	NEI	2	NEI	4	NEI	NEI	NEI
	Public awareness, mass media and social marketing on healthy eating	10	3	3	NEI	4	NEI	NEI	2	3	8	6-9	3	NEI	3	NEI	NEI	NEI	NEI	NEI	NEI	1.5	2	NEI	2	NEI	4	NEI	NEI	NEI
N (2)	Guidelines and programmes to provide support in primary care to people who are overweight and obese	NA																												
	Nutrition counselling in primary care	NA																												
	Training for health professionals	NA																												
G	Nutrition education on curricula	NA																												
	Community-based nutrition education	10	NEI	2	NEI	NEI	NEI	NEI	2	NEI	8	NEI	NEI	NEI	NEI	NEI	NEI	NEI	NEI	NEI	NEI	NEI	NEI	NEI	2	NEI	4	NEI	NEI	NEI
	Cooking skills	NA																												
	Initiatives to train school children on growing food	NA																												
	Training for chefs, caterers and food service providers	NA																												
M & S	Monitoring and surveillance of dietary intake	NA																												
	Monitoring and surveillance of diet-related health outcomes	NA																												
	Monitoring and surveillance of food environments	NA																												
	Monitoring and surveillance of nutrition policy actions	NA																												

NA = not applicable or not relevant to current project; NEI = no example identified for this application

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5.4.2. The most promising fit-for-purpose ‘unhealthy’ food definitions and food classification systems for key policy and practice applications

The attributes of no single food classification system meet the requirements of every food policy application (Table 15). However, there is a clear pattern of alignment of particular definitions of ‘unhealthy’ food and food classification systems and specific policy applications; these are summarised in Table 16.

As can be seen in Table 15, some domains of the NOURISHING (plus) framework contain several variations on the same theme of potential policy action. For example, under the domain “R” for restriction of advertising of ‘unhealthy’ food and drinks there are seven variations on advertising restriction (three of which focus on channel or mode, rather than the nutrition quality of the food advertised). This potentially distorted the appearance of Table 15 and the perception of relative merit of each food classification system. Therefore, variations in each theme were grouped together under key applications in the summary table (Table 16), which outlines the most promising ‘unhealthy’ food definitions and food classification systems for each group of policy and practice application.

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Table 16. The most promising 'unhealthy' food definitions and food classification systems for key policy and practice applications

Key application	Policy aim - requirement	Most promising classification systems in order
Interpretive front-of-pack food labelling (e.g. traffic lights) or summary single score e.g. Health Star Rating (HSR)	To identify healthier and less healthy options within category (relative) To encourage product reformulation	1. Nutrient profiling system- where clear nutrient cut-points are provided across a spectrum (preferable) or summed to provide a summary single score
		2. Dietary guidelines (categories based on food groups (e.g. seven in ADGs) with potential for nutrient cut-points to be applied)
Warning signs: Interpretive front of pack food labels, menu labels, shelf labels	To identify clear 'unhealthy' choices	1A. Dietary guidelines (discretionary choices) using food lists
		1B. NOVA system (Ultra-processed foods) using food lists
Discriminate 'healthy' food and drinks as vehicle to carry nutrient claims and health claims on food labels	To identify clear 'healthy' choices	1A. Dietary guidelines (5 food groups (previously 'core') and healthy oil and spreads groups) using food lists
		1B. NOVA system (unprocessed and minimally processed foods) using food lists
Standards for foods available in public sector settings, including schools, hospitals and other health settings and workplaces - includes vending machines	To identify clear 'healthy' choices to provide and promote and clear 'unhealthy' choices to restrict	1. Dietary guidelines (7 categories based on food groups with potential for nutrient cut-points to be applied)
		2. Nutrient profiling system – where clear nutrient cut-points are provided across a spectrum (preferable) or summed to provide a summary single score - with clear system cut-points too
		3. Mixed approach of two above systems: first applying dietary guidelines to identify healthy choices and listing (core foods) then using nutrient profiling system to discriminate unhealthy choices (e.g. not stocking any additional foods with HSR <3.5)
Health–related food taxes and subsidies	To identify clear 'unhealthy' choices to tax and clear 'healthy' choices to exempt from taxes To identify clear 'healthy' choices to subsidise and clear 'unhealthy' choices to exempt from subsidies	1. Dietary guidelines (7 categories based on food groups with potential for nutrient cut-points to be applied)
		2. NOVA system (4 categories based on level of processing)

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Key application	Policy aim - requirement	Most promising classification systems in order
Regulation of food advertising	To identify clear 'healthy' choices to advertise and promote and clear 'unhealthy' choices to restrict from advertising	1. Dietary guidelines (categories based on food groups with potential for nutrient cut-points to be applied)
		2. NOVA system (4 categories based on level of processing)
		3. Nutrient profiling system- where clear nutrient cut-points are provided across a spectrum (preferable) or summed to provide a summary single score
		4. Mixed approaches: First applying dietary guidelines to identify 'healthy' choices and listing foods that can be advertised (core foods) then applying a nutrient profiling system with system-level cut-points to identify 'unhealthy' choices that cannot be advertised
Product reformulation initiatives (also applies to specific "salt" example provided in NOURISHING framework)	To identify healthier and less healthy options within category (relative) and key negative and positive nutrients to reduce or increase	1. Nutrient profiling system – where clear nutrient cut-points are provided across a spectrum (preferable) or summed to provide a summary single score
		2. Dietary guidelines (7 categories based on food groups with potential for nutrient cut-points to be applied in discretionary food category)
Commitment to reduce portion size	To identify clear 'healthy' choices to increase portions (vegetables only) and clear 'unhealthy' choices to reduce portions	1. Dietary guidelines 'healthy' = non-starchy vegetables; benign = other 4 'core' food groups plus healthy oil and spreads groups); 'unhealthy' options = (discretionary) using cut-points if required
		2. Nutrient profiling system – where clear nutrient cut-points are provided across a spectrum (preferable) or summed to provide a summary single score- with clear accurate, evaluated system-level cut-points also to identify 'healthy' and 'unhealthy' food and drinks
		3. Mixed approaches: First applying dietary guidelines to identify 'healthy' choices (vegetables) for portion increase then applying a nutrient profiling system with accurate, evaluated system cut-points to identify unhealthy' food and drinks for portion reduction
Development of food based dietary guidelines and guidelines and specific food groups	To provide evidence-based population level dietary recommendations about what people should eat (healthy foods to eat more of; unhealthy foods to eat less of)	1. Dietary guidelines (7 categories based on food groups with potential for nutrient cut-points to be applied in discretionary food category)
		2. NOVA system (4 categories based on level of processing)
Community based nutrition education, mass media, social marketing campaigns	To provide evidence-based population level information about what people should eat (healthy foods to eat more of; unhealthy foods to eat less of)	1. Dietary guidelines (7 categories based on food groups with potential for nutrient cut-points to be applied in discretionary food category)
		2. NOVA system (4 categories based on level of processing)

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The type of key nutrition policy applications in the NOURISHING framework fall into three main groups: one where the policy intent requires relative identification of 'healthier' and 'less healthy' foods within food categories; the second where the policy intent requires absolute identification of 'healthy' and 'unhealthy' food and drinks both within and across food categories; and the third which focuses on the channel, mode and how an intervention is conducted, or on reduced portion size, rather than the type of food.

Definitions of 'unhealthy' food and drinks and systems of food classification are not relevant to the third type of nutrition policy application, so they are not considered here. Strengths and limitations of promising definitions of 'unhealthy' and food classification systems identified in the literature review for the other two types of policy applications are presented below.

5.4.2.1. Strengths and limitations of promising definitions of relatively 'unhealthy' food and drinks and food classification systems for policy applications requiring relative indication of nutritional quality within food categories

Examples of this first type of policy application include interpretive front-of-pack food labelling (e.g. traffic lights) or summary single score (e.g. Health Star Rating or HSR) front of pack labelling schemes and product reformulation initiatives. The strengths and limitations of each promising definition of relatively 'unhealthy' food and drinks and system of food classification identified in the literature review for these applications are included below.

Firstly, however, it must be highlighted that a general limitation of the food classification systems suited to application in policy actions that require ***relative*** indication of nutritional quality within food categories is that they do not usually include a specific term for 'unhealthy' food and drinks. As such a term is often required in nutrition policy and practice applications, several proxy terms for 'unhealthy' food and drinks have been developed by existing schemes; for example "red foods" (England, South Korea), "red category" foods (NZ, UK), "red-whoa" foods (US [CDC]) or "dark orange" foods (Belgium, France, Switzerland) in colour-coded nutrient profiling systems and "low score" or "low star" foods in summary single score systems (Australia and New Zealand) . Some schemes also develop proxy terms for 'healthy' food and drinks too; for example "green" foods (England, South Korea), "green category foods" (NZ, UK), "green go" (US [CDC]), "dark green" foods (Belgium, France, Switzerland) or "green choice" drinks (some US cities including Boston) in colour-coded systems, or "preferable" foods (Netherlands) and "keyhole" foods (Denmark, Norway, Sweden, Iceland).

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5.4.2.1.1. Nutrient profiling systems providing relative terms for 'less healthy' foods

Nutrient profiling systems - where clear nutrient cut-points are provided across a spectrum (preferable) or summed to provide a summary single score - are the most promising food classification systems for these policy applications (Tables 12, 13, 14, 15). The literature review identified **strengths** of these nutrient profiling systems including:

- good awareness by consumers
- as a voluntary system, nutrient profiling is accepted by the food industry
- clear identification of specific nutrients or food components for reformulation
- supported by food regulators (clear cut-points)

- UK ‘traffic light’ nutrient-profiling system was evaluated against selected risk factors for cardiovascular disease (only).[23]

The literature review identified **limitations** of nutrient profiling systems for these applications including:

- the arbitrary nature of the nutrients/ingredients and cut-points used currently in more than 70 models globally
- they do not support promotion of healthier choices across category, so risks that may not lead to healthier diet or reduced risk of diet-related disease
- evaluations are lacking for most systems at impact and outcome level. In particular, no summary single score systems have been evaluated at impact or outcome level (the literature claims the HSR system has been evaluated, but this has been conducted only at process level24)
- lack of transparency of some systems and lack of potential for replicability (private databases; unclear algorithms, lack of public availability of consultations etc.) is seen as problematic
- not supported by all public health groups (seen as ‘reductionist’)
- many systems can be ‘gamed’ resulting in unintentional proliferation and promotion of unhealthier products
- some systems suffer from low credibility (as they don’t ‘work’ across categories; may contain non-intuitive categorisations; and not all systems are transparent)
- they do not support necessary transformation of food system
- evaluated systems need to be made mandatory to be effective; regulation likely required.

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5.4.2.1.2. Food-based dietary guideline systems providing relative terms for ‘less healthy’ foods

The literature review also identified that food-based dietary guidelines (such as the ADGs which outline seven food categories) may have potential for these policy applications if the option to apply nutrient cut-points to discriminate ‘less healthy’ food and drinks within different food categories is applied (Table 13, 13, 14, 15). Food-based dietary guidelines (with a focus on avoiding negative nutrients) were also identified in use in 14 European countries (listed in Table 9, category UG2) as well as Israel, Korea, Mexico, New Zealand and South Africa.

Identified **strengths** of this approach include:

- based on quality evidence from systematic reviews of food, diet and health relationships
- transparent system of development, including public consultation and detailed published responses
- accepted by most public health nutrition groups, nationally and internationally

[23] Although one paper identified in the systematic literature review (Phase One) of this project [128] stated that nutrient ‘cut-off’ criteria were validated during the development of the UK multiple traffic light nutrient profile model, none of the three references cited in that paper presented comprehensive evidence of relationships between foods classified by nutrient profiling with food and health outcomes.
[24] For example, see Jones et al 2019 [141].

- accepted by food industry groups (in peer reviewed papers).

Limitations of food-based dietary guidelines approaches for these applications identified in the literature and the report of Phase One of this project include:

- low awareness by consumers, policy-makers and other end-users[25]
- the application of nutrient cut-points may erode confidence in the identified relationships between consumption of specific foods and health outcomes, as the nutrient cut-points used to classify food exposure variables vary widely in the literature, and leads to a wide variety of apparently arbitrary nutrient cut-points being applied internationally
- one potential solution is to apply a range of nutrient cut-points across the continuum; however this approach is unlikely to be accepted by food regulators, who desire very specific nutrient cut-points for precise categorisation.

5.4.2.2. Strengths and limitations of promising definitions of 'unhealthy' and food classification systems for policy applications requiring absolute indication of nutritional quality within and between food categories

The second type of policy applications require absolute identification of 'healthy' food and drinks which the population needs to consume more of and/or identification of 'unhealthy' food and drinks that the population needs to consume less of to achieve health and wellbeing and reduce risk of diet-related disease [1, 14, 103]. Examples of these types of applications include: provision of warning signs on front of pack food, menu or shelf labels; identification of 'healthy' food and drinks as appropriate vehicles to carry nutrient and health claims on food labels; setting standards for foods available in public sector settings (schools, hospitals and other health settings and workplaces, including vending machines); health-related food taxes and subsidies; regulation of food and drink advertising; manipulation of portion sizes; development of food-based dietary guidance; and community education, mass media and social marketing campaigns. Examples of terms used include "discretionary" choices (Australia), "discretionary" products [23], and "discretionary calories" (USA). Other terms, such as "empty-calorie, nutrient poor" or "energy dense, nutrient poor" are sometimes used as synonyms for these concepts, but are not always defined in the literature (Table 8).

Three approaches were identified as most promising for these types of applications (Table 13, Table 14, Table 15, Table 16):

- food-based dietary guideline classification methods;
- the NOVA system based on food processing;
- and mixed methods approaches.

The strengths and limitations of each promising definition of 'unhealthy' food and drinks and system of food classification for these second type of policy applications identified in the literature review are presented below.

5.4.2.2.1. Food-based dietary guidelines systems with specific terms for 'unhealthy' food and drinks

[25] The report of Phase One of this project presents evidence that the ADGs are not well promoted and are misinterpreted frequently [4].

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Specific terms for ‘unhealthy’ food and drinks used in different food-based dietary guidelines systems include “discretionary”, “extra”, “occasional”, “non-core”, “sometimes” and “junk food” [4].

The **strengths** of food-based dietary guidelines systems for these applications include:

- strong graded evidence from systematic reviews of food and health relationships; focuses on identification of food and drinks with evidence of health benefit or harm and strong program logic
- identification of ‘healthy’ food and drinks and ‘unhealthy’ food and drinks as the converse of each other
- transparent system of development, including public consultation and detailed published responses
- accepted by most public health nutrition and clinical groups
- accepted by food industry groups (in peer reviewed papers)
- highly suited to food group promotion e.g. fruit and vegetables
- already applied, and widely accepted in Australia, to develop food lists to discriminate ‘unhealthy’ food and drinks that attract GST.

Limitations of dietary guidelines approaches for these applications identified in the literature and the report of Phase One of this project include:

- low awareness by consumers; ADGs not well promoted or widely read, and are misinterpreted frequently – see Phase One report [4]
- inconsistencies in detailed definitions provided in glossaries in different dietary guideline publications can lead to ambiguities
- restricted to assessing food exposure variables as described in the reviewed literature, e.g. when the literature was reviewed for the ADGs 2013, there were not many studies on fruit juice or fruit drinks available for review, and the lowest sugar categories of breakfast cereals in the literature was <30%; the literature available has moved on in both these examples, highlighting the urgent need for update of the ADGs
- lack of consistent nutrient cut-points applied internationally, as the cut-points described in included studies in systematic reviews vary greatly
- some stakeholders (such as food regulators) may be challenged by the lack of need to apply nutrient cut-points to define ‘unhealthy’ and ‘healthy’ food and drinks from the literature
- perception that contemporary issues like environmental sustainability were not addressed in the ADGs may lead to their value in other areas being dismissed
- lack of published mapping of ultra-processed food category against discretionary choices (intersection of both may have merit).

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5.4.2.2.2. Food classification systems based on the level of processing, specifically the NOVA framework, with specific terms for ‘unhealthy’ food

Several manuscripts identify that the NOVA system, based on level of food processing, is potentially promising for the types of policy application requiring absolute definitions of ‘unhealthy’ food and

drinks. The specific term for 'unhealthy' food and drinks used in the NOVA classification is "ultra-processed foods" (UPF).

The **strengths** of the NOVA system identified include:

- very high awareness by consumers
- it supports choice both within and across categories
- quality evidence from impact and outcome evaluations is strengthening in several areas and emerging in others; focuses on identification of food and drinks with evidence of harm
- evidence from food exposure studies supports direct translation of the ultra-processed food category into a metric for policy action
- recent evidence that it is the proportion of UPF in the diet, rather than the amount of risk nutrients they carry, that is the problem, especially for weight gain
- gaining a strong international following.

Limitations identified for the NOVA system include:

- criticisms that the definitions have changed over time
- mechanistic rationale/logic still unclear
- some groups see the schema as a proxy for specific sub-set of addition of saturated fat and/or added sugar and/or added salt and/or added alcohol to foods during processing, characteristics that are more aligned with dietary guidelines or nutrient profiling systems
- may be considered unrealistic to limit processed food in current food system
- not accepted generally by the food industry
- some stakeholders (such as food regulators) may be challenged by the lack of need to apply nutrient cut-points to define 'unhealthy' and 'healthy' food and drinks from the literature
- lack of published mapping of discretionary choices against ultra-processed food category (intersection of both may have merit)
- needs to be mandatory.

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5.4.2.2.3. Food classification systems using a mixed approach with specific terms for 'unhealthy' food

Where mixed approaches have merit, they tend to be a mixture of food-based dietary guidelines and nutrient profiling systems applied to specific food categories, often including the generation and provision of food lists. Mixed approaches that include non-specific definitions such as "nutrient-dense, energy-poor" foods are more limited in potential (Tables 8, 9 and 14). Examples include application in food supply initiatives in school and other public sector settings, such as in NSW and NT canteens, which first apply dietary guidelines to identify healthy 'core' foods allowed, then use a nutrient profiling system to discriminate 'unhealthier' choices (e.g. not stocking any additional foods with an HSR <3.5). Identified **benefits** include that it can be easier for public sector and volunteer staff such as canteen workers to identify the foods to limit or avoid stocking by food labels rather than referring to long food lists or trying to apply nutrient cut-points themselves. **Limitations** include that many combined systems still rely on an accurate (evaluated) and mandated front-of-pack labelling nutrient profiling system, otherwise the mixed approach risks inadvertently promoting 'less unhealthy' choices rather than 'healthy' options.

To be useful in mixed applications requiring absolute definitions of ‘unhealthy’ food and drinks, nutrient profiling systems must apply system-level cut-points at specific points across the continuum of more healthy and less healthy food and drinks. Terms used to describe ‘unhealthy’ food and drinks in these systems include “red” and “unhealthy” foods *per se* (section 5.4.3.1).

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6. Discussion

6.1. Strengths and limitations of this evidence review

To our knowledge this is the first systematic review of peer-reviewed reviews and key websites of different definitions of 'unhealthy' food and drinks and food classification systems and their potential application to nutrition policy and practice internationally.

6.1.1. Strengths

This systematic review identified the definition and application of specific terms and concepts of 'unhealthy' and 'healthy' food and drinks in different food classification systems, in different countries, in different settings and policy environments and by different sectors. It also identified the strengths and limitations of the variety of approaches taken to define 'unhealthy' food and drinks in these contexts, and to apply such terms to translate the scientific evidence on food, diet and health relationships into policy and practice.

Within the timeframes provided, a feasible, practical and comprehensive search strategy was developed to answer the primary and secondary research questions:

- How are countries, comparable to Australia, differentiating 'healthy' and 'unhealthy' (discretionary) food and drinks for application in nutrition policy actions?

  and

- In these countries where there has been evaluation of the nutrition policy actions, what are the reported health outcomes, strengths and limitations of the approaches taken to differentiate 'healthy' and 'unhealthy' food and drinks?

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While nine peer-reviewed reviews were identified that specifically considered the strengths and weaknesses of different food classification systems, six of these focused specifically on nutrient-profiling systems, and only one of these was a systematic review [3]. Of the commentary (narrative) reviews identified, one focused on the NOVA system and ultra-processed foods and one focused on stakeholder perceptions of application of nutrition quality metrics. The one scoping review identified focussed on dietary sugars specifically. No identified reviews considered multiple definitions of 'unhealthy' food and drinks and/or different food classification systems, let alone comparing and contrasting findings to inform recommendations for further investigation, confirming the novelty of this current review.

6.1.2. Limitations

Limitations may have arisen as a result of the search strategy applied. A systematic review of reviews, conducted as the pilot search of the primary literature for Phase One of the project [4], identified that when all individual papers were included, there were over 17,000 discrete papers returned for title and abstract searching, which was deemed not feasible in the available timeframe. Further, only systematic reviews of peer-reviewed reviews were included, as the pilot search for Phase One [4] identified that when all reviews were included (searching just the databases MEDLINE, PREMEDLINE, ERIC, EMBASE, and Web of Science) there were 3465 discrete reviews returned for title and abstract searching, which was not deemed feasible within the available timeframe.

Given the evidence presented in Phase One of this project that suggested that different sectors preference different terminology and concepts around 'unhealthy' and 'healthy' food and drinks [4],

the possibility that the members of the Phase Two review team, who are predominantly public health nutritionists, may be biased also was addressed by enlisting the services of an independent public health expert (Dr Fjeldsoe) to conduct the searches for this systematic review.

The impetus for this project was focused on 'discretionary' food and drinks which is a term arising from the Australian Dietary Guidelines; the term is not used commonly in New Zealand. However, the Australian and New Zealand food regulatory systems are intertwined. This raises potential limitations with respect to both scope and generalisability.

One potential limitation in the study design arose due to the inherent delay associated with publication of systematic reviews of peer-reviewed reviews. This could have precluded any relevant evidence from recent single studies being included in results. The risk of potential bias was highest for exclusion of any recent single studies on any emerging classification system and/or for exclusion of any recent evaluations of any food classification systems. It was postulated that the major food classification system affected by this limitation would be the more recently emerging NOVA classification using the "ultra-processed foods" definition. However, details of some recent 'lower order' developments, such as the French Nutri-Score food labelling application based on the UK nutrient profiling system (captured in Table 11), may also have been missed inadvertently.

Another limitation is that the systematic review did not identify any reviews or websites that included the concept of 'environmental sustainability' or 'equity' specifically within the definition of 'healthy' food and drinks. All included reviews focused on human health and wellbeing. It may have been implied that 'unhealthy' food and drinks were unsustainable, but this was not explicit in any included review or website. Consideration of 'environmental sustainability' and 'equity' in the definition of 'healthy' food and drinks would be desirable given the three principles of the Australian Food and Nutrition Policy 1992 are: health and wellbeing; equity; and ecological sustainability [8, 9].

6.1.2.1. Addressing potential limitations of this systematic review

To help address the potential limitations in the study, the project team requested additional publications of interest to the funders for consideration, qualitatively, in this discussion. This material was also hand-searched to identify additional publications from authoritative international bodies, such as the United Nations and the World Health Organization, which might assist further in interpretation of the findings of the systematic review. Much of the additional material identified related to the term "ultra-processed" foods and drinks used in the NOVA food classification system based on degree of food processing.

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6.2. Terms and definitions for 'unhealthy' (and 'less healthy') food and drinks applied currently in nutrition policy and practice

A wide range of food classification systems and terms and definitions of 'unhealthy' and 'healthy' (and 'less healthy' and 'healthier' foods) were identified during the literature search. A major point of difference was between the systems designed to identify absolute 'healthy' and 'unhealthy' food and drinks (such as food-based dietary guidelines and systems based on degree of food processing), and those designed predominantly to differentiate 'healthier' and 'less healthy' choices (predominantly nutrient profiling systems).

Up until the 1990s, it was commonly claimed by representatives of the food industry that there was "no such thing as 'healthy' or 'unhealthy foods', only 'healthy' or 'unhealthy' diets" [10, 11]. However, the potential for certain foods to carry nutrient and health claims on their labels, and hence be

promoted as ‘healthy’ options, appears to have contributed to changes in this view in several countries and regions dating from the early 2000s [11].

Compared to ‘healthy’ food and drinks, the concept of ‘unhealthy’ food and drinks remains less well embraced by some sectors, particularly those with vested interest in marketing these products [4]. This is illustrated specifically by the recent uptake of effective “warning” labels on ‘unhealthy’ food and drinks in several low and middle income countries, and the opposition to such warning labels seen in most OECD countries (Appendix 4A, Table 8). Relative terms for ‘less healthy’ food and drinks defined by nutrient profiling systems tend to be more accepted by some sections of the food industry than absolute terms for ‘unhealthy’ food and drinks [3].

However, some nutrient profiling systems do attempt to make it easier for consumers to avoid ‘unhealthy’ food and drinks by inclusion of system-level nutrient cut-points to guide the use of terms such as “red foods” (England, South Korea), “red category” foods (NZ, UK), “red-whoa” foods (US CDC) or “dark orange” foods (Belgium, France, Switzerland) in colour-coded nutrient profiling systems, and “low score” or “low star” foods in summary single score systems (Australia and New Zealand) or warning labels (Brazil and Chile). Warning labels were found to be more effective than traffic light labelling in a randomised controlled experiment in Brazil [12].

Such approaches are usually applied in food, shelf or menu board labelling, and have been used also in food supply initiatives in public sector settings.[26] One interesting recent development in this area is that of labelling, such as with the Physical Activity Calorie Equivalent (PACE) label, that identifies the time in physical activity required to burn off the energy content of discretionary food and drinks [104].

Identification of relatively less ‘unhealthy’ food and drinks can introduce risk that consumption of these foods is inadvertently promoted over that of unlabelled foods that are actually ‘healthy’, such as fresh fruit and vegetables [11].

The relative terms for ‘healthier’ foods identified by nutrient profiling systems include “green” foods (England, South Korea), “green category foods” (NZ, UK), “green go” (US CDC), “dark green” foods (Belgium, France, Switzerland) or “green choice” drinks (some US cities including Boston) in colour-coded systems, or “preferable” foods (Netherlands) or “keyhole” foods (Denmark, Norway, Sweden, Iceland). School canteen systems in some Australian jurisdictions use the terms “everyday foods” and “thumbs up” foods (in more remote areas).[27] In many countries, several of these terms are used as proxies for the absolute term ‘healthy’ food and drinks, and are used in marketing accordingly.

Other food classification systems more directly identify ‘unhealthy’ and ‘healthy’ food and drinks based on the nature of the relationship between their consumption and health outcomes in quality studies. The absolute terms for ‘unhealthy’ food and drinks identified by these methods include “ultra-

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[26] Some reviews suggested that nutrient profiling systems should be used to inform advertising restriction. While nutrient profiling systems have been used for this purpose, generally it is recognised in the literature that these systems cannot be used to identify ‘unhealthy’ food or drinks absolutely rather than relatively unless the nutrient profiling system applied is accurate, that any system cut-point applied has been evaluated against health outcomes, that they system is transparent, and the system is mandated by legislation [3]. While application of an accurate, evaluated nutrient profiling system consistent with that used in a food labelling system could improve transparency and remove ambiguity in application of advertising codes, limitations in practice remain the varied and arbitrary nature of cut-points applied in the definition of ‘unhealthy’ food and drinks by this approach [3].

[27] Menzies School of Health Research have developed an App for use in schools in the NT in Australia that uses thumb direction signs (https://apps.apple.com/au/app/good-tucker/id1284206429). It is based on both the ADGs and the HSR system. Products of 3.5 and 4 stars are categorised as one thumbs up; Products less than 3.5 stars get a thumbs down. If products are 3.5 stars or more, and flagged as discretionary choices, they get a thumbs sideways sign. Products 4.5 stars or more get two thumbs up. The system also includes special rulings for some products such as diet drinks and fruit juices.

processed food" (Brazil), "energy-dense nutrient poor" (several countries and regions), "junk food" (Australia), "non-core foods" (Australia and New Zealand) and "occasional" foods (some school systems in Australia). The absolute terms for 'healthy' food and drinks identified included "five food group" (Australia), "four food group" (NZ, Canada), "core" (Australia – pre 2013, but often misused) and "basic, healthy" foods.

Interestingly, most terms and synonyms in common use are proxies for the term 'unhealthy' or 'healthy' food, and it may be a better option to use these terms to directly designate 'healthy' and 'unhealthy' food.

Phase one of this project, and the results of the literature review of Phase two reported here, showed very high levels of misquoting, misuse and misinterpretation of terms describing 'healthy' and 'unhealthy' food and drinks. Disparities differed according to the type of publication, the sector and/or profession using the terms, the existence of any conflict of interest, and the type of policy and practice application in which the terms were used ([4]; Appendices 4A, 4B and 4C; Tables 7, 8 and 9).

The results of the literature review identified how other countries approach and refer to 'healthy' and 'unhealthy' food and drinks (section 5.3). Key learnings that may be applicable to the Australian context include the need to:

- identify the most suitable terms, definitions and food classification systems for different policy and practice applications;
- ensure that the different systems applied in policy and practice will deliver healthier diets, improve health and wellbeing, and reduce risk of diet-related disease at a population level (i.e. that the food classification systems are based on evidence and are evaluated at impact (effect on diet) and outcome (effect on health) level, not just at the level of process indicators, such as awareness, understanding, uptake, acceptability etc.);
- acknowledge that food classification systems designed to differentiate relatively 'less healthy' and 'healthier' foods may not deliver 'healthy' diets or improve diet-related health at population level;
- consider protective aspects of whole foods, such as the food matrix or degree of processing, as well as the content of nutrients and/or other food components on health outcomes (and the converse) (i.e. avoid reductionist approaches to food classification systems);
- ensure complete transparency, and support potential replicability of testing, of all methods and approaches applied;
- ensure those with vested interests are not involved in policy development, but rather policy implementation,[28] consistent with the recommendations of the World Health Organization [5-7];
- work collaboratively internationally to seek evidence-informed consensus on potentially arbitrary decision points applied in some food systems (including criteria around the

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[28] In the context of the Health Star Rating system, Australia is only one of four nations internationally that includes representatives of the food industry on governance groups making recommendations on food and nutrition policy actions (Thow et al unpublished data, under review, as presented at the Food Governance Conference, University of Sydney Law School, July 2019: https://sydney.edu.au/law/our-research/research-centres-and-institutes/sydney-health-law/food-governance-conference.html)

number, nature and/or value of foods, drinks, nutrients, food components or other ingredients, nutrient-specific cut-points, or system cut-points);

- mandate, potentially via legislation, evaluated food classification systems, to ensure they function most effectively;
- promote and market terms, definitions and rationale of selected evaluated food classification system/s to ensure high levels of understanding, acceptance, uptake and accurate and consistent application among consumers and all sectors.

Whatever evidence-based definition of unhealthy food or food classification system is applied, it is imperative that the approach is actioned in multiple food policy and practice applications to address the barriers to, and opportunities for, healthy eating in the community, and is effectively marketed and promoted [105].

6.3. Terms and food classification systems that may enhance consumer understanding of the concepts underpinning 'unhealthy' eating

6.3.1. Aim of this review and rationale for terms and definition/s proposed

(Re)investigating any alternative terms for 'discretionary food and drinks' that may enhance consumer understanding of the concepts underpinning 'unhealthy eating' e.g. "ultra-processed food", "energy-dense nutrient poor", "unhealthy foods and drinks", "junk food" and "non-core foods" was a stated requirement of this project.

However, as can be seen from the results, it is neither sensible nor possible to recommend a specific defined term for 'unhealthy' food and drinks without reference to the food classification system to which it corresponds. Also, importantly, different terms inherent in different food classification systems are most suited to different applications.

If one term, definition and food classification system was suitable for application in all potential food and nutrition policy and practice actions, it would have been clearly indicated by a column of green in Table 15 and would have dominated Table 16. However, no such single solution emerged.

This lack of a clear dominant term, definition and food classification system suitable for application in all potential food and nutrition policy and practice actions is consistent with the evidence presented in all included peer-reviewed reviews. It also helps explain why so few attempts appear to have been made globally to identify such a universal approach.

However, the main requirement of a definition of 'unhealthy' food and drinks, by default, is that it must be based on the relationship between the consumption of the food or drink product and the risk of:

- poor diet,
- diet-related risk factors, and
- adverse diet-related health outcomes.

With respect to terminology, as noted in section 6.2, of the over 20 different terms and synonyms for 'unhealthy' food and drinks identified in this systematic review, the most promising terms and synonyms for 'unhealthy' food applied in the peer reviewed reviews and national and international

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websites across all policy and practice applications, are proxies for the term ‘unhealthy’ food and drinks *per se*. A better option would be to use this actual term to directly designate ‘unhealthy’ food.

Further, of the 13 different food classification systems identified in this project, across all policy and practice applications, ‘unhealthy’ food is potentially defined most promisingly in four key food classification systems. In identifying these four potential options, this globally unique project has achieved an extraordinary outcome. These four most promising definitions and food classification systems, and the implications of strengths and weaknesses for application in different nutrition policy and practice applications, are discussed below.

6.3.2. Description of the term for ‘unhealthy’ food and drinks, the most promising food classification systems identified and implications for application in policy and practice

Description of the four most promising food classification systems was drawn from the included reviews and websites (section 5.3 and section 5.4), augmented with material drawn from the more recent review for the UN Food and Agriculture Organization of the NOVA classification system [106].

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6.3.2.1. Definitions of ‘unhealthy’ food and drinks (most commonly ‘less healthy’ food and drinks) as described in nutrient profiling systems

Nutrient profiling systems classify foods on the bases of their content of selected nutrients and/or other specific components of ingredients (section 5.3, section 5.4). A very wide range and number of different nutrients, components and ingredients have been applied across different units (such as per weight, per serve, per energy) in nutrient profiling systems globally (section 5.3, section 5.4).

Generally, however, nutrient profiling systems are developed to identify ‘healthier’ and ‘less healthy’ foods relatively on a spectrum. In this regard, nutrient profiling systems can be particularly useful to inform product reformulation. However, while reformulation may be useful to help reduce population intake of sodium and/or added sugar, expert commentators have queried whether there is such a thing as a ‘less unhealthy’ food with respect to other selected nutrients (section 5.3, section 5.4). For example, Fardet and colleagues note in reference to reformulation of ‘unhealthy’ food and drinks that “the view that it is better to reformulate ultra-processed foods than avoid them altogether underplays the complexity of potential harm: these foods deliver risk nutrients into the body, displace nutritious foods from the diet, and as the products of industrial processing they can have peculiar physical structures or chemical compositions that are also risk factors for adverse health outcomes” [107]. The effectiveness of reformulation also has been questioned by the results of modelling studies [108].

Nutrient profiling systems may be used to indicate absolute ‘unhealthy’ and/or ‘healthy’ food and drinks specifically only where system-level cut-points are applied (for example, on the basis of selected nutrient content below or above a specific value). Internationally, the content and nature of the system ‘cut-points’ vary very widely (section 5.3, section 5.4).

The most common nutrient profiling system applied globally is the UK model, which has been used or tested in a number of peer-reviewed studies over the past 10 years. It has also served as the basis for the development of other models, such as the Food Standards Australia New Zealand Nutrient Profiling Scoring Criterion (itself used as the basis for the Health Star Rating System used for food labelling in Australia and New Zealand), the Five-Colour Nutrition Label used in France and the model of the Broadcasting Authority of Ireland [3]. The model has been revised a number of times, most recently in 2018 (section 5.3, section 5.4). For food labelling, colour coded ‘traffic light’ systems have

been applied frequently also, and have been evaluated at impact as well as process level. Most other systems have been evaluated at process level only (section 5.3, section 5.4).

As can be seen by the results (section 5.4), nutrient profiling systems are most suited to applications requiring relative terms for 'less healthy' and 'healthier' foods. The strengths of nutrient profiling systems (section 5.4.2) include: high awareness by consumers (especially where accompanied by application of system cut-points to colour code relative healthiness); they are accepted by sections of the food industry (when applied voluntarily, apparently as they can be applied selectively to promote specific products); they provide a good basis for product reformulation (although, with the exception of sodium and added sugar, this may not necessarily lead to a healthier diet); and they provide clear cut-points, so tend to be supported by food regulators (section 5.3, section 5.4).

Conversely, nutrient profiling systems are criticised (section 5.4.2) as being reductionist [10, 109] in that they do not reflect the nutritional value of the whole food. There is growing body of evidence that interactions in whole foods between nutrients, other food components, mechanisms of food processing and the food matrix itself need further consideration when determining nutrient/food component level cut-off points [10, 109].

A major related challenge is the arbitrary nature and value of the cut-points applied currently in more than 70 models used by governments in food policy applications globally, and that, as they promote 'healthier' rather than the most 'healthy' products, and don't support promotion of healthier choices across category, they do not necessarily lead to healthier diets or reduced risk of diet-related disease at the population level (section 5.3, section 5.4).

Evaluations at impact and outcome level (predictive validity) are lacking for all nutrient profiling systems, especially across the full range of diet-related health issues. In particular, no summary single score systems have been evaluated at impact or outcome level.[29] There is also growing international concern that many nutrient profiling systems can be 'gamed', for example through addition of inulin or fruit juice, resulting in unintentional proliferation and promotion of unhealthier products (section 5.3, section 5.4).

The dominant focus on nutrients in nutrient profiling approaches has been described as 'reductionist' as it does not take into account any effect of the food matrix or level of processing on the specific health qualities of each food, and the latter have rarely been examined. For example, systematic reviews have shown that consumption of milk, cheese and yoghurt, regardless of fat content, is associated with reduced risk of ischemic heart disease and myocardial infarction, stroke, hypertension, colorectal cancer (Grade B), and renal cell cancer, rectal cancer, improved bone mineral density, metabolic syndrome and type 2 diabetes (Grade C) [1]. Recommendations to consume mostly reduced fat milk are based on total diet modelling, rather than any intrinsic health risk associated with consumption of full fat milk itself. This is because the lower energy content of reduced fat milk provides 'room' within recommended energy intake limits for the inclusion of adequate quantities of other healthy foods in the total diet. So any system that discriminates milk, cheese and yoghurt on the basis of saturated fat content inadvertently penalises full fat milk compared to reduced fat milk on the basis of dietary patterns, rather than the nature of the relationship between health outcomes and consumption of the food itself. In the absence of studies assessing the relationship between consumption of foods of different nutrient profiled characteristics with health outcomes, it is

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[29] The literature claims the HSR system has been evaluated, but this has been conducted only at process level around metrics such as awareness and uptake, not at the level of impact on diet or effect on any health outcomes.

not clear that adherence to the recommendations of such nutrient profiling systems would actually deliver health outcomes at population level (section 5.3, section 5.4).

It is critical to note that the finding of this systematic review that unless validated system-level cut-points are applied to identify absolute 'unhealthy' food and drinks, and these are denoted clearly in some way – such as by the use of warning labels as applied currently in countries such as Brazil and Chile –nutrient profiling systems do not meet the requirements of a fit-for-purpose definition/s of 'unhealthy' food and drinks for application in most settings and policy environments. Hence nutrient profiling systems differ from the other three potential food classification systems identified below, as they require additional qualification around the need for application of validated system-level cut-points (which do not exist currently internationally), together with clear depiction of 'unhealthy' choices, to meet the requirements of the aims of this project.

6.3.2.2. 'Discretionary' definition of 'unhealthy' food and drinks as defined by the Australian Dietary Guidelines or similar

Dietary guidelines provide scientifically-based advice on the foods, food groups and dietary patterns to promote overall health and prevent chronic disease [1]. They are designed as a policy tool, rather than a food classification system *per se*. Guidelines and food guides (providing specific recommendations for the types and amounts of food throughout the life course) form the basis for public food and nutrition, health and agricultural policies and programs to foster healthy eating habits and lifestyles. The World Health Organization and the Food and Agricultural Organization of the United Nations recommend that all countries develop food-based dietary guidelines that reflect their own dietary patterns [110].

The Australian Dietary Guidelines provide guidance on consumption of foods and drinks to promote health and wellbeing and prevent diet-related disease [1]. The Australian Dietary Guidelines are informed by five key sources of evidence [1] including:

- the previous series of dietary guidelines and their supporting documentation [1]
- the Evidence Report [102], which presents systematic reviews of food, diet and disease/health relationships, from the period 2002–2009
- Nutrient Reference Values 2006 [111]
- the Food Modelling System [112], which models the amounts of the five food group foods, healthy fats (spread and oil) allowance, and discretionary choices (if any), that comprise healthy dietary patterns within energy requirements of different age and gender groups of different energy expenditure (physical activity levels) in Australia
- key authoritative government reports and additional literature (including a commissioned review on diet in pregnant and breastfeeding women) [113].

The Australian Dietary Guidelines (ADGs) and Australian Guide to Healthy Eating advise people to: achieve and maintain a healthy weight, be physically active and choose amounts of nutritious food and drinks to meet your energy needs; enjoy a wide variety of nutritious Five Food Group foods (FFG) every day, and limit intake of 'discretionary' foods and drinks [1, 114]. According to the ADGs, "discretionary foods and drinks are not a necessary part of a healthy diet and are high in saturated fat, added sugars, salt and/ or alcohol". There are also guidelines on: encourage, support and promote breastfeeding; and care for your food; prepare and store it safely.

Identified strengths of food-based dietary guidelines approaches to classify foods (section 5.4.2) include that they are based on quality evidence from systematic reviews of food, diet and health

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relationships [102]; follow a transparent system of development, including public consultation and detailed published responses; are accepted by most public health nutrition groups, nationally and internationally; and are accepted by food industry groups (in peer reviewed papers).

However, the results of Phase One [4] found evidence of low rates of understanding of the definition, intent and application of the term 'discretionary food and drinks' as outlined in the ADGs. The results suggested that greater clarity and consistency around the term 'discretionary food and drinks' could help reduce the high degree of misunderstanding, misinterpretation and misuse of the term, synonyms and relevant concepts. Limitations of dietary guidelines identified in the literature review in Phase Two (section 5.4.2) confirmed the results of Phase One and included: low awareness and understanding by consumers, policy-makers and other end-users; and that they reflect the way that food groups are classified in the epidemiological literature (which may reflect a wide range of descriptors, including nutrient cut-points, that are not able to be summarised clearly). The latter point can contribute to misunderstanding by some stakeholders, as the evidence-base of food, diet and health relationships is constantly evolving; for example at the time the literature was reviewed to inform the ADGs (2013), there were relatively few studies on the health effects of fruit juice, or on a full range of sugary breakfast cereals. Therefore one limitation of food-based dietary guidelines is that they must be updated regularly (section 5.3, section 5.4).

6.3.2.3. The ''ultra-processed' definition of 'unhealthy' food and drinks as defined by the NOVA classification system

Over recent decades the number of industrially processed food products in the global food supply has increased as the prevalence of obesity and diet-related non-communicable disease has also increased in many countries [115]. Among the six main food processing classification systems investigating this phenomenon [106] the most prominent is NOVA, originating in Brazil in 2009 from Carlos Monteiro and team [106]. The NOVA system groups foods into four categories according to the nature, extent and purpose of industrial processes (physical, biological and/or chemical) they undergo:

1. Unprocessed and minimally processed foods: Examples include fruit, vegetables, nuts, meat, eggs and milk. Minimal processing may include drying, pasteurisation, cooking or chilling.

2. Processed culinary ingredients: Examples include oils, butter, sugar and salt. They undergo some processing to make products that can be used in cooking Group 1 foods but they're not meant to be consumed by themselves.

3. Processed foods: Examples include preserved fruit and vegetables, canned fish, cheese and fresh bread. They're usually made from two or three ingredients.

4. Ultra-processed foods: These undergo a multitude of processes including many that couldn't be recreated in the home, such as hydrogenation, extrusion, moulding and pre-processing for frying. They contain little, if any, intact Group 1 foods and are industrial formulations that will usually have five or more ingredients, many of which are designed to mimic the qualities of Group 1 foods. Ingredients might include non-sugar sweeteners, hydrolysed proteins, hydrogenated oils and emulsifiers. And they're usually packaged attractively and promoted with intensive marketing.

Examples of ultra-processed foods listed by Monteiro et al (2019) include: "sweet or savoury packaged snacks; ice-cream, chocolate, candies (confectionery); mass-produced packaged breads and buns; margarines and spreads; cookies (biscuits), pastries, cakes, and cake mixes; breakfast 'cereals', 'cereal' and 'energy' bars; 'energy' drinks; milk drinks, 'fruit' yoghurts and 'fruit' drinks; cocoa

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drinks; meat and chicken extracts and 'instant' sauces; infant formulas, follow-on milks, other baby products; 'health' and 'slimming' products such as powdered or 'fortified' meal and dish substitutes; and many ready-to-heat products including pre-prepared pies and pasta and pizza dishes; poultry and fish 'nuggets' and 'sticks', sausages, burgers, hot dogs, and other reconstituted meat products, and powdered and packaged 'instant' soups, noodles and desserts".

Ultra-processed foods can be characterised by ingredients that are generally not found in other categories, such as those: directly extracted from foods, such as casein, lactose, whey, and gluten; derived from further processing of food constituents, such as hydrogenated or interesterified oils, hydrolysed proteins, soy protein isolate, maltodextrin, invert sugar and high fructose corn syrup; additives such as dyes and other colours, colour stabilisers, flavours, flavour enhancers, non-sugar sweeteners; and processing aids such as carbonating, firming, bulking and anti-bulking, de-foaming, anti-caking and glazing agents, emulsifiers, sequestrants and humectants [116, 117]. More details are included in a table extracted from the FAO report by Monteiro et al [106] included at Appendix 6.

Studies of the relationship between consumption of the food groups of the NOVA system and nutritional quality of food purchases, overall diet and risk of non-communicable disease (NCD) [115] have been reviewed recently in a report for the Food and Agriculture Organization of the United Nations [106]. Findings support an association between the NOVA classification and consumption of nutrients associated negatively with non-communicable disease including saturated and trans fats, added sugars, and sodium, as well as high dietary energy density, and conversely protective nutrients such as dietary fibre [106]. However, not all studies are of good quality, and include ecological and cross-sectional design (omitted from the ADGs) as well as more robust longitudinal study designs including cohort studies. Of the 26 available studies examining the relationship between ultra-processed food exposures and NCDs, those in adults reported associations with obesity, coronary heart disease, cerebrovascular disease, other cardiovascular diseases, breast cancer and overall cancer risk (but not for prostate or colorectal cancer), incidence of depression, risk of irritable bowel syndrome and functional dyspepsia and risk of frailty in adults. One small, recent randomised controlled trial of 20 inpatients, who were exposed to ultra-processed versus unprocessed diets for 14 days each, found that the ultra-processed diet caused increased ad libitum energy intake and weight gain despite being matched to the unprocessed diet for presented calories, sugar, fat, sodium, fibre, and macronutrients [118]. Four available studies in children, again of variable quality, report associations between ultra-processed food exposures and cholesterol, LDL cholesterol, waist circumference, wheezing and asthma [106]. The report identifies the need for further quality research, particularly for children and other priority groups.

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The NOVA system has been criticised, including by Gibney et al (2017) as identified in this review (section 5.4.2), as the mechanistic rationale and program logic is still unclear. Protagonists argue that there is nothing intrinsically wrong with food processing, and point to the benefits of processes such as drying, non-alcoholic fermentation, chilling and freeing, and vacuum packing, which are used commonly to improve shelf life, palatability and food safety, such as pasteurisation of milk [26]. However, Monteiro et al (2019) have argued that "processing" should be seen as a proxy for classification of foods on the basis of their health effects/harm [106]. Recently, also, the strong processed food industry linkages, and hence conflicts of interest, of over 31 of 34 identified key critics of the system have been highlighted [119].

Globally, support for the NOVA system appears to be growing exponentially, in developed economies and both middle and low income economies [106, 116, 120]. The identified strengths of the NOVA system (section 5.4.2) include: very high awareness by consumers; it supports choice both within and across categories; evidence from impact and outcome evaluations is strengthening in several areas and emerging in others, and evidence from food exposure studies supports direct translation of the

'ultra-processed' food category into a metric for policy action, and it is gaining a strong international following.

Limitations identified for the NOVA system (section 5.4.2) include that: definitions inherent in the system have changed over time; the mechanistic rationale/logic is still unclear; the schema is a proxy for addition of saturated fat and/or added sugar and/or added salt and/or added alcohol to foods during processing, characteristics that are more aligned with nutrient profiling systems than processing per se; it is unrealistic to limit processed food in current food system; and the system is poorly accepted by the food industry.

6.3.2.4. Multiple definitions of 'unhealthy' food and drinks

Promising food classification systems that apply multiple definitions of 'unhealthy' food and drinks tend to be a mixture of food-based dietary guidelines and nutrient profiling systems, where nutrient cut-points are applied to specific food categories (section 5.4.2). The approach first applies dietary guidelines classification to identify clear 'unhealthy' or 'healthy' food and drinks and then a nutrient profiling system to discriminate food choices that fall in between each group, or to 'cap' categories. For example, under such a capped system the star rating of a discretionary food might be no more than two stars (or some other arbitrary value), and the star rating of a five food group food might be no less than four. Limitations highlighted by this example include that many combined systems still rely on an accurate (evaluated) and then mandated front-of-pack labelling nutrient profiling system, otherwise the mixed approach risks inadvertently promoting 'less unhealthy' choices rather than 'healthy' options.

The food list of 'discretionary' choices generated by the Australian Bureau of Statistics to assist analysis and interpretation of the Australian Health Survey 2011-2013 is an example of a food classification system that uses multiple definitions of 'unhealthy' food and drinks [16]. Another example is the detailed, searchable food list generated by the Australian Taxation Office (ATO) [121] used to check if a food or beverage item is Goods and Service (GST) free or taxable[30].

Challenges arise when the same terminology is used by different food classification systems. For example, the ABS list [16] uses the same term ('discretionary' food and drinks) as applied in the ADGs [1] as it was trying to remove any potential ambiguity around classification of 'unhealthy' food and drinks where epidemiological studies may not have provided clear differentiation of exposure variables, comparators or significance of effect. Although this was informed by lack of inclusion on the list[31] of 'healthy' food and drinks included in the modelling to produce the Australian Guide to Healthy Eating [112], the ABS list was developed by 'expert' opinion of a small group; although there is generally good agreement between the products of the different approaches by the ABS and NHMRC, there are some key differences between the two as highlighted in the report of Phase One [4]. However, it was identified in Phase One that the authors of several peer-reviewed publications presume that the ABS list of 'discretionary' foods and drinks is identical to that of the ADGs, use the ABS list as a proxy for 'discretionary' foods as defined in the ADGs, and criticise the latter when they don't agree with the former [4].

To be useful in applications requiring absolute definition of 'unhealthy' and 'healthy' food and drinks, multiple definitions still require application of system-level cut-points at specific points along the continuum of 'healthier' and 'less healthy' foods. A major limitation is that any such potential cut-points remain arbitrary. More studies would be required to investigate the benefits and/or risks of applying

[30] In Australia, "basic healthy foods" do not incur GST.
[31] Appendix 8 in the modelling document [112].

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various criteria to determine the relationship between application of such cut-points and potential health outcomes. However, as exemplified by the wide acceptance of the ATO food list, it is possible to secure wide stakeholder agreement on the tools developed by application of multiple definitions to differentiate.

6.4. Relationships between different food classifications

Epidemiologically, it is understood that ideally definitions of 'unhealthy'/'healthy' food and drinks embedded in different food classification systems should be validated against dietary improvements (impact evaluation) and diet-related health consequences (outcome evaluation) before being implemented widely in nutrition policy and practice applications.

Nutrition is a highly contested area, as shown by the results of Phase One of this project [4] which presented evidence that different sectors, including different groups of health professionals, consumers, educators, industry representatives and social media influencers, interpret dietary guidance and use terminology, such as 'discretionary' food and drinks, in different ways in different circumstances and applications to suit different agendas. The results of Phase One also showed that different sectors and groups interpret the nutrition science evidence base differently, and do not necessarily accept the evidence on which the NHMRC Australian Dietary Guidelines are based [1].

Therefore, the lack of a widely-accepted gold standard food classification system, as identified by predictive validity testing, has led to a multitude of studies of construct/convergent validity of one food classification system against another food classification system. The results of such construct/congruent validity testing cannot be used to identify whether one food classification system is superior to another, merely to help identify where they may differ. However, the literature review suggests that construct/congruent validity testing is being used inappropriately to advocate for one system over another in a number of cases. This may inadvertently imply that one food classification system is superior to others. However, as identified previously [13], this review has confirmed that different terms inherent in different food classification systems are most suited to different nutrition policy and practice applications.

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6.4.1. Relationship between food-based dietary guidelines and nutrient profiling systems, with particular focus on the relationship between the Australian Dietary Guidelines and the Health Star Rating Scheme used in Australia and New Zealand

The review did not identify any published peer-reviewed reviews of the relationship between food categorisation in dietary guidelines and systems based on nutrient profile. Little comparative data of the different systems used globally appear to be available currently; this is likely because of the great diversity of nutrient profiling systems in place in different countries.

In Australia there have been several studies of the alignment of the Australian Dietary Guidelines (ADGs) and the nutrient profiling approach applied in the Health Star Rating (HSR) system. Alignment between the ADGs and the HSR system was one of the factors investigated in the recent five year review of the HSR system (hereafter "the HSR review") [122] . A list of studies on the HSR system that include such comparison is published in the bibliography of the HSR review [122]. Most of these include methodological flaws highlighted in the introduction to this section (above).

According to the HSR Guide to Industry, an 'anomaly' occurs within the HSR system when a star rating is inconsistent with the ADGs, or when used to make comparisons within a food category or across comparable food categories that would mislead consumers [123]. The report of the HSR review [122] noted that one way of examining the alignment of the HSR system with the ADGs was to consider how well it scores products against the ABS Discretionary Foods List [16]. This list is not

entirely consistent with the ADGs[32]; however all comparison studies identified in the HSR review and in Phase One of this review [4] used the ABS list to identify discretionary food and drinks. The HSR review refers to the ABS Discretionary Foods list as "the Australian Health Survey list", and states that it is currently under review by the NHMRC [122]. However, the nature or existence of such a review to produce a Discretionary Food and Drinks list could not be confirmed by the review team.

Although the report of the HSR review states that "a principle in the development of the HSR System was to ensure, where possible, that products eligible to carry a health claim and FFG foods score an HSR ≥ 3, while discretionary foods score an HSR < 3" [122],[33] different studies have used different cut-points to indicate consistency between the two systems. The report of the HSR review cites a paper from 2016 to state that "recent monitoring data shows that 95% of consumers believe an HSR ≥ 4 is 'healthy', while 97% of consumers believe an HSR ≤3.5 is 'unhealthy' [124].

The first such study assumed that an arbitrary, liberal HSR of 3.5 to 5 stars should indicate consistency with the ADGs Five Food Group (FFG) foods and an HSR of 0.5 to 3.5 stars should indicate 'discretionary' foods; the study was commissioned by NSW Health to examine the appropriateness of HSR for use in school canteens and applied the HSR algorithm to 11,500 potential products across 30 food categories in a private database held by the George Institute [125]. The study found 79% agreement for FFG foods and 86% agreement for discretionary foods [125].[34] Therefore the HSR algorithm misclassified one in five FFG foods (with HSR of ≤3.5) and one in seven discretionary foods (an HSR ≥3.5).

The significant number of anomalies and outliers identified suggested some disconnect between the HSR system and the ADGs, in that the HSR system did not adequately encourage consumption of foods, food groups and dietary patterns consistent with the recommendations of the ADGs, or discourage consumption of 'discretionary' choices. The assertion by some commentators is that the HSR system risks undermining evidence-based dietary advice and creating a food environment that contributes to consumer misinformation; potentially decreasing consumer trust in the system [126]. A nationally representative CHOICE survey on the HSR system conducted in 2018 showed that, while 92% of respondents were aware of HSRs, just over half (57%) trust the HSR system [127].

One peer reviewed paper identified in the systematic literature review in Phase One of this project (Lee et al 2018), attempted specifically to define 'healthy' food and drinks by investigating alignment between the HSR system and the ADGs. This study [128] found 86.6% overall alignment with the ADGs, with FFG foods scoring an average HSR of 4 stars and discretionary foods scoring an average HSR of 2 stars. Of the 1,435 anomalies identified, the authors considered that 83% reflected ADG failure on the basis of their nutrient profile.[35] Only 17% of the outliers were attributed to issues with

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[32] Examples of foods identified as discretionary in the ADGs but not in the ABS system include: some commercially fried foods; some foods and mixed dishes with processed and/or fatty meat; some commercial pizzas and burgers; thick shakes from fast food restaurants; deserts like crème caramel and crème brûle; and coconut cream and coconut milk. Examples of food and drinks identified as part of the Five Food Groups in the Australian Dietary Guidelines but not in the ABS system include: some homemade pizzas made with toppings from the Five Food Groups; some sandwiches and rolls filled with foods from the Five Food Groups; bread, garlic or herb, homemade, cooked; dressings and sauces made with unsaturated oils; and homemade dips made with food from the Five Food Groups such as guacamole. See section 5.1.6 in the report of Phase One of the project for more details [4].

[33] It has been suggested that a mid-scale 'cut-off' point of 2.5 as a "pass mark" would be a more meaningful differentiation of 'unhealthy' and 'healthy' food and drinks [126]. However, no information about target 'cut-off' points to differentiate 'healthy' or 'unhealthy' food and drinks inherent in the design of the HSR system was identified that could be used for comparison, either in Phase One or Phase Two of this systematic review.

[34] NSW Health subsequently introduced a mixed food classification system based both of the ADGs (calling FFG foods "everyday" foods) and the HSR system in canteens: https://healthy-kids.com.au/school-canteens/canteen-guidelines/nsw-healthy-school-canteen-strategy/

[35] Rather than considering the epidemiological evidence presented in the ADGs.

the HSR System, including in relation to sauces, dressings, spreads and dips, savoury snacks, meats and meat products, convenience foods, fruits and sweetened yoghurts. However, this study has been criticised: for its arbitrary choice of liberal nutrient content 'cut-off' points (discretionary foods were assessed as 'outliers' if they displayed a Health Star Rating of ≥ 3.5 on a 5 point scale); for not considering assessment of healthiness by any formal epidemiological evidence synthesis and translation procedure; and for using the UK nutrient profiling system as a presumed gold standard to assess the performance of both the ADGs and the HSR system [129].

Conversely, a paper from the HSR Technical Advisory Group [130][36], used an arbitrary nutrient content 'cut-off' point of 3 for the same purpose and, using a privately-available database, reported only 61% of discretionary foods scored Health Star Rating <3.0, and only 84% of Five Food Group foods scored HSR ≥3.0. It identified 660 Five Food Group outliers (mainly cheese and yoghurts) and 835 discretionary food and drink outliers, with the majority coming from savoury sauces and gravies (31%), soups and stocks (12%), ice creams and ice confections (11%) and muesli bars (8%).

The final report of the HSR review [122], cited the paper and two reports discussed above [125, 128, 130] and others [124, 131] including those critical of the HSR system [126], to support the finding of the review that there is good agreement between the HSR and the ADGs [122]. The report claimed that "a number of reviews have examined the alignment of the HSR System with Dietary Guidelines, consistently showing that healthy Five Food Group foods receive higher HSRs than discretionary foods".[37] This seems to be a very low standard against which to judge alignment between the two food classification systems.

Challenges exist in that the HSR system is voluntary, so food companies can choose to display stars on only their 'healthiest' products, leading to marketing distortion. For example, half of the new discretionary products actually available in the Australian market between April and December 2016 displayed ≥3 HSR stars [126]. Further, research between 2014 and 2017 found that HSR logos appeared on only 28% of eligible products in 2017, and 76.4% of these displayed a HSR of ≥3.0 [132].

As the ADGs are designed to be a policy tool rather than a food classification system per se, and the ADGs classify foods based on graded evidence of association between their consumption and health outcomes and/or risks of ill-health outcomes, it is not surprising that there is little accord between such classifications and the HSR system that classifies foods predominantly on (arbitrarily) selected nutrient cutpoints, which are not necessarily related to health outcomes.[38] Differences in interpretation of what constitutes 'alignment' are apparent across sectors, often due to the adoption of different 'cut-points', criteria and definitions used to interpret results.

Key differences between the approach, scope and focus of the ADGs and the HSR system which impact on the ability of the HSR system to discriminate 'unhealthy' food and drinks include: minimum scoring of half a star for 'unhealthy' food and drinks which may imply a degree of 'healthiness'; a

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[36] The HSR System website reports that "This Consultation Paper is informed by the TAG's in-depth review of the technical components of the system. The TAG developed a range of technical papers on various issues identified by stakeholders, available on the mpconsulting website". However, the review team could not locate such reports on the mpconsulting site, therefore the citation is provided as per the Phase One report without a URL.

[37] For example, the report cites a study published in 2018 that found the median HSR actually displayed on discretionary foods was 2.5, significantly lower than the median HSR of 4 for FFG foods (Lawrence et al 2018). However, the purpose of this study was to note the dominance in the market place of foods receiving high stars, given the voluntary nature of the scheme - the figures cited do not reflect the relative median scores of both categories if all products were required to carry HSR stars.

[38] The executive summary of the final report of the HSR review includes a statement that "Studies consistently show that the System is well aligned with Dietary Guidelines and effectively directs consumers towards foods lower in energy, saturated fats, sugars and sodium" [122].

strong focus on unpackaged produce and whole foods in the ADGs in contrast to the scope of the HSR system, which currently focuses on packaged foods only, noting a recent recommendation to extend the system to fruit and vegetables in the future to better support healthy food choices [122]; the focus on added sugar in the former and total sugar in the latter[39]; little focus on protein in the former but an emphasis on protein in the latter; the ability to 'offset' negative nutrients with perceived healthy ingredients in the latter; and specific differences in the way some foods are handled, such as accepting fruit juice as equivalent to fruit in the HSR system.

The report of the HSR review [122] presumably reflects submissions to the review from all stakeholder groups, which may explain several errors. For example, the report states "The Calculator considers the content of foods in terms of both negative components that Dietary Guidelines recommend limiting (energy, saturated fat, *sugars*, sodium); and positive components that Dietary Guidelines recommend consuming (*protein*, dietary fibre and fruits, vegetables, nuts and legumes (FVNL)" [122] (italicised emphasis added). This statement is not accurate with respect to sugars or protein, as the ADGs recommend avoiding foods high in *added sugars* not *sugars per se*, and do *not* recommend Australians consume more *protein* [1]. Further, the claim that "studies consistently show that the System is well aligned with Dietary Guidelines and effectively directs consumers towards foods lower in energy, saturated fats, sugars and sodium" [122], is potentially misleading, given that the recommendations of the ADGs are based on the relationships between consumption of foods and health-related outcomes, rather than on their (selected) nutrient content. These excerpts exemplify continued misinterpretation and misquoting of the ADGs by specific sectors as identified in Phase One of this project [4].

Consistent with the findings of Phase One of this review, this phase of the project found that transparent, replicable research to assess alignment of the HSR nutrient profiling system with the definition and intent of the term 'discretionary food and drinks' and synonyms as outlined in the ADGs is required urgently.

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6.4.2. Relationship between food-based dietary guidelines systems and systems based on degree of food processing

There could be expected to be some overlap between foods classified as "discretionary" and "ultra-processed" in different systems. However, no published review of the relationship between food categorisation in food-based dietary guidelines systems and systems based on degree of food processing was identified in this study, and little data appear to be available currently.

However, some relevant studies are underway in Australia. The result of one study provided confidentially to the review team by PhD student Pricilla Pereira Machado of Carlos Monteiro's team in Brazil, compared 1,953 food codes in the Australian Bureau of Statistics database used to analyse the 2011-12 Australian National Nutrition and Physical Activity survey [133] with the same foods classified in the four categories of the NOVA framework. The study found that 39% of the codes were classified as ultra-processed foods but not discretionary foods (including dry biscuits, flavoured yoghurts, soy beverages and energy-controlled frozen meals), 7% of the codes were classified as discretionary choices but not as ultra-processed foods (including sugar, honey, canned vegetables in brine, bacon and jam) and 54% were classified as both discretionary and ultra-processed foods.

Outlining a similar study, a recent American Society of Nutrition conference abstract by Professor Dorothy Mackerras, Chief Nutrition Advisor of FSANZ, presented the results of a study comparing

[39] These points are still not recognised clearly in the final report of the HSR review as detailed in the next paragraph.

5,645 food types listed in the same database with their classification in the four groups of the NOVA framework [134]. Of 4,014 foods recommended by the ADGs, 23.5% were classified as ultra-processed. Nearly one quarter of the foods would be recommended to the public by one classification system, but not the other. Some notable discrepancies included recommendation of commercially available bread and unsaturated spreads in one system, but classification of these foods as ultra-processed, so not recommended in the other; and the classification of home prepared cakes, biscuits and jams as discretionary, but not as ultra-processed foods. No further information is available about the study at present. The abstract concluded with the statement that "the two specific classifications do not lead to equivalent advice about which foods to choose" [134].

A very recent study [135] applied the NOVA system to reanalyse the results of the Australian National Nutrition and Physical Activity Survey 2011-2013 [136], finding that the proportion of energy intake of Australian adults and children derived from: processed culinary ingredients was 6.8%; unprocessed or minimally processed foods was 15.8%; processed foods was 15.8%; and from ultra-processed foods was 42.0%. This compares with 35% of energy intake of adults and 39% of energy intake of children being derived from discretionary food and drinks [137].

In Brazil, a recent paper looking at different methods to evaluate children's dietary intake in relation to Brazil's new nutrition guidelines found that the literature was marred by inconsistencies and variation in study definitions and methods, making it hard to draw firm conclusions [138].

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6.4.3. Relationship between nutrient profiling systems and systems based on degree of food processing

This review did not identify any published reviews of the relationship between food categorisation in nutrient profiling systems and those systems based on degree of food processing. Little comparative data of these different systems used globally appear to be available currently; this is likely because of the great diversity of nutrient profiling systems in place in different countries. However, a Canadian study generally found a higher frequency of front of pack nutrition claims on heavily processed food [139].

In Australia, we are aware of one study of the alignment of the nutrient profiling approach applied in the Health Star Rating (HSR) system and the NOVA system [140]. This study found that 95% of 215 high market share ultra-processed foods contained added sugars (described in 34 different ways), 55% carried an HSR, and 55% achieved an HSR of ≥3.5.

Given the very different conceptual frameworks underpinning these two classification systems, such lack of alignment is expected. Some commentators have argued that systems based on food processing would have stronger program logic if they focused on processing that adds saturated fat, sugar or salt [26]. Others authors have expressed concern that nutrient-dense foods are found at all levels of processing, and that avoidance of some ultra-processed foods such as wholegrain enriched breads and wholegrain enriched cereals, and some milks, may not address obesity but may contribute to diets low in folate, calcium and dietary fibre [141]. It has also been pointed out that, as added sugars are a criterion for designation as an ultra-processed food, high levels of agreement between ultra-processed food and added sugar intake are tautology, rather than proof [141].

A very recent study [135] applied the NOVA system to reanalyse the results of the Australian National Nutrition and Physical Activity Survey 2011-2013 [137] and found positive and statistically significant linear trends between quintiles of ultra-processed food consumption and intake levels of individual

nutrients and other dietary variables of interest[40]: free sugars (standardised β 0.43, p<0.001); total sugars (β 0.08,p<0.001), saturated fats (β 0.18, p<0.001), trans fats[41] (β 0.10, p<0.001); sodium (β 0.21, p<0.001) and diet energy density (β 0.41, p<0.001); inverse relationships were observed for dietary fibre (β -0.21, p<0.001) and potassium (β -0.27, p<0.001). The prevalence of intake levels of all studied 'negative' nutrients increased linearly across quintiles of ultra-processed food intake, notably from 22% to 82% for free sugars, from 6% to 11% for trans fat and from 2% to 25% for dietary energy density, from the lowest to the highest ultra-processed food quintile. The authors concluded that "the high energy contribution of ultra-processed foods impacted negatively on the intake of non-ultra-processed foods and on all nutrients linked to non-communicable diseases in Australia" [135].

6.5. The preferred approach of different sectors

The literature review conducted for Phase One [4] identified a wide variety of definitions and interpretations of the term 'discretionary food and drinks' in the peer-reviewed literature, proffered documents and websites reviewed. Less than 40% of included documents provided a definition of 'discretionary food and drinks' that aligned with the definition and intent outlined in the Australian Dietary Guidelines (ADGs) [1]. The term, concept and underlying evidence base appear relatively well understood and applied by dietitians/nutritionists, non-government organisations, and government preventive health sectors, but less so by other public health professionals, those from a science/social science background, non-health professionals, the food regulatory sector, and/or those with conflicting and commercial interests. The education and consumer sectors did not use the term 'discretionary food and drinks' frequently. The term was used infrequently by sections of the food industry sector except in peer-reviewed publications, where more representatives of that sector (60%) used the term in alignment with the ADGs than any other sector. On websites and in submissions, food industry groups favoured the term "treat food" rather than 'discretionary food' and referred to nutrient profiling systems rather than the ADGs. Such selective use of terminology for different audiences implies intentional, rather than accidental, application.

Analysis of Australian websites showed most government health and education departments were using the ADGs to inform a 'traffic light' approach to classifying foods supplied in school tuckshops /canteens; however NSW and NT are now using an approach that combines the ADGs with nutrient profiling systems. Website analysis showed that Food Standards Australia New Zealand (FSANZ) specifically focused on nutrient profiling approaches to define 'healthy' food and drinks for front of pack labelling, health claim and fortification initiatives. However, the results of this review suggested that nutrient profiling systems are not the most appropriate method to assess the suitability of foods to carry health claims (section 5.4.2.), as illustrated recently in a validation study using breakfast cereals that found that claim type is completely uncorrelated to actual nutrition quality, yet influences the inferences consumers make about taste, healthiness, and dieting [142].

Analysis of 18 popular food and nutrition blogs found only about half the webpages reviewed aligned (broadly) with the ADGs recommendations. There was frequent use of terms to describe 'healthy' food and diets such as "gluten-free", "dairy-free" and "Paleo" that do not align with the terms, concepts or evidence base in the ADGs, yet have apparently high following among the population.

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[40] Such a study on the relationship between consumption of individual nutrients and other dietary variables has not been conducted for 'discretionary' food and drinks – however, given the definition of 'discretionary' foods in the ADGs, similar results could be expected.
[41] Trans fat data are very limited in the ABS food composition database, so these results should be interpreted with caution.

The results of the literature review conducted in Phase Two confirmed preference for different food classification systems by different sectors. In particular, authors with manufacturing food industry connections tended to be very critical of the NOVA framework. Many public health groups expressed concern about the great diversity, and lack of impact and outcome evaluation, of nutrient profiling systems globally. In general, the apparently arbitrary nature of quantitative criteria and cut-points applied in nutrient profiling systems is of concern for public health nutritionists and nutritional epidemiologists (Appendix 4A; Table 8). Conversely, the results of Phase Two support the evidence identified in Phase One, that some public health groups who arguably may have a conflict of interest, tend to support and advocate for the food classification system that they use most in their research [11, 106, 128, 129, 143].

This review also identified apparent differences in the food classification systems preferred by different sectors as evinced by the information provided on their websites, with health protection and food regulation agencies using nutrient profiling systems dominantly, and the broader public health and education sectors preferring application of food-based dietary guidelines and specific food lists (Table 9).

The national websites tended to reflect government initiatives, and were more focused on four particular applications of food classification systems than the peer-reviewed reviews; these applications were food-labelling, reformulation, healthy food procurement strategies (especially in schools) and, to a lesser extent, on communication and education initiatives (Table 8; Table 9). The first three applications predominantly relied on nutrient profiling systems to differentiate 'less unhealthy' foods and 'healthier' foods.

As recommended by the World Health Organization, there is a need to ensure transparency, rigour and public scrutiny of government food and nutrition policy, regulatory and norm-setting activities to ensure they are adequately protected from undue commercial interest [5-7]. The specific risks of involving sectors of the food industry with commercial interests in defining criteria in nutrient profiling systems are illustrated by the failure of the Smart Choices Program in the USA [29] (see section 5.3.2.2.4.).

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6.6. The difficulties defining 'unhealthy' and 'healthy' food

Given the challenges in defining 'unhealthy' and 'healthy' food it is not surprising that this systematic review did not identify a previous systematic review on this topic. However, some objective insights on the difficulty of the task were contained in some of the literature identified, and were useful in helping inform conclusions.

The study examining different methods to evaluate Brazilian children's dietary intake in relation to Brazil's new nutrition guidelines found that the literature was marred by inconsistencies and variation in study definitions and methods, making it hard to draw firm conclusions [138]. Leme and colleagues concluded that "the development of tools to evaluate the complexities of dietary intake is much needed. Such a tool needs to be accepted and adopted by numerous study groups, to describe dietary status among Brazilian children and devise the most effective, and to evaluate the success of nutrition education programs" [138]. Hence, they suggest that, even in the country where it was developed, the NOVA system may have limited application.

The difficulties in defining 'unhealthy' and 'healthy' food noted in this systematic review were also observed in a narrative review conducted in 2009 by Corinna Hawkes; the executive summary of which is available on an archived website of Health Canada [13]. Hawkes' report provided an overview of what 19 governments had done to define 'healthy' and 'unhealthy' foods, as well as

definitions developed by the private sector, non-government organisations (NGOs), and academic researchers at the time. It looked at the application of these definitions in six policy areas: foods with added nutrition/health qualities; food labelling; food product development; food in public settings; food advertising and promotion; and food programs for vulnerable households. The findings were that the question – at least from a government standpoint – was not so much "Is it healthy?" but "Who is it 'healthy' for?" and "In what context does a food become 'unhealthy'?" [13].

There still appears to be a need to increase mutual understanding and respect of different perspectives to defining 'unhealthy' food and drinks, as identified in one included peer-reviewed review which dealt specifically with controversies over restriction of sugary drinks in the USA SNAP program [27]. Schwartz proposes that this be done by acknowledging that the rationale behind different perspectives is fundamentally the same – the belief that a fair and just society cares for and protects vulnerable citizens and their health [27]. There appears to be a need to restore trust between different sectors, authentic engagement between communities, and adoption of terms, definitions and a food classification system that both incentivises increased consumption of 'healthy' food and drinks and restricts consumption of 'unhealthy' food and drinks.

Corinna Hawkes' review is prefaced by a very apt quote:[42]

"The first issue is the definition of healthy foods. No matter who we are speaking with about this idea… the first question was, well, what's a healthy food? And the second question was, who decides what's a healthy food? It sounds like fairly simple questions with simple answers. It turns out it's not so simple."

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[42] Statement made to the Healthy Incentives Pilot (HIP) Symposium, U.S. Department of Agriculture, October 16, 2008, Arlington, Virginia. Quoted in Hawkes 2009.

7. Conclusions

7.1. The problem

Very few Australians regularly consume a diet that adheres to the Australian Dietary Guidelines (ADGs). In 2010-11, less than 4% of Australians ate enough of the nutritious five food group (FFG) foods (fruits, vegetables and legumes, grain foods, lean meats, poultry, fish, eggs or plant-based alternatives, and milk, yoghurt and cheese or plant-based alternatives) [103]. At least 35% of total daily energy intake of adults, at least 39% for children and at least 41% for Aboriginal and Torres Strait Islander groups came from 'discretionary' food and drinks, contributing to excess energy intake and unwanted weight gain, and displacing intakes of nutritious five food group foods from the diet [103]. In 2011-2013, three quarters of nine to 18 year old Australians regularly exceeded the WHO's advice to limit 'added' or 'free' sugars to less than 10% of total energy intake [144].

In 2014, the Australian Bureau of Statistics found from analysing household expenditure data that 58% of consumer spending on food and drinks was on 'discretionary'[43] items and only 17% was on fruit and vegetables [145]. This has been confirmed by studies of food price and affordability using food price data collected in-store [146].

Given these dietary patterns, it is not surprising that one quarter of Australian children and 63% of adults are overweight or obese, and the prevalence and incidence of diet-related health problems, such as cardiovascular disease, type 2 diabetes and some forms of cancers, are high in Australia [1, 14, 15].

This problem may in part be an unintended consequence of taking a reductionist approach – for example, applying a nutrient-based, rather than a food and dietary pattern-based, approach to nutrition science – which has resulted in a food system that is not supporting the health of the population, vulnerable groups or, indeed, the health of the planet [147].

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7.2. The solution

To improve the health of Australians it is imperative that the population is supported to consume healthy diets; this means consuming more 'healthy' five food group foods and consuming less 'unhealthy' food and drinks [1, 14-16]. To achieve this will require improved food environments to help people chose healthy foods and consistent messaging to increase understanding of agreed, evidence-based definitions of 'unhealthy' and 'healthy' food.

The fact that adherence to the food-based recommendations of the ADGs is used most commonly to characterise both the problem of, and solutions to, the diet-related health of the population, suggests this approach has merit as a public health tool.

However, evidence of low rates of understanding of the definition, intent and application of the term 'discretionary food and drinks' as outlined in the ADGs was identified in Phase One of this project. This suggests that much more needs to be done to promote and disseminate the evidence-based recommendations of the ADGs and help translate them into policy and practice in Australia. Identifying a widely accepted fit-for-purpose definition of 'unhealthy' and 'healthy' food and drinks is an important step in this process.

[43] See section 6.3.1.4 regarding the ABS list of 'discretionary' foods and drinks.

7.3. Suggested definitions arising from findings of the review

The evidence presented in Phase One and Phase Two of this project has considered the current definition/s of 'discretionary' and synonyms for 'unhealthy' food and drinks and application and alignment across current nutrition policy, programs and guidance, both nationally and internationally.

7.3.1. Terminology

Of the over 20 different terms and synonyms for 'unhealthy' food and drink identified in this project, across all policy and practice applications, the evidence suggests that the direct term 'unhealthy' food and drinks holds most promise, as all other terms and synonyms, including 'discretionary' food and drinks are proxies for this concept itself. Currently, different stakeholders, sectors and consumer groups interpret the term 'unhealthy' food and drinks differently.[44] However, this may be a strength rather than a limitation, as general messaging to consume more 'healthy' food and drinks and consume less 'unhealthy' food and drinks is likely to have resonance with each group, while allowing for potential contemporary social marketing around evidence-based terms and concepts. Further investigation, such as transparent public consultation and qualitative research including focus groups, is recommended to test the utility of this approach.

The findings of this systematic review support a recommendation that the most promising term for 'unhealthy' food and drinks and synonyms is 'unhealthy' food and drinks.

This work was commissioned to explore and develop a fit for purpose definition for 'discretionary foods and drinks' as this is the terminology used in the current Australian Dietary Guidelines [1]. The evidence presented in this systematic literature review supports replacement of the term 'discretionary' food and drinks with the term 'unhealthy' food and drinks.

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7.3.2. Definition of 'discretionary food and drinks' and 'unhealthy' food and drinks

By default, 'unhealthy' food and drinks (and 'discretionary' food and drinks) are those whose consumption is associated with negative health impacts and outcomes. Further, 'unhealthy' food and drinks (and 'discretionary' food and drinks) are the inverse of 'healthy' food and drinks. The evidence presented in this systematic review suggests that 'healthy' food and drinks are defined as those for which the best available epidemiological evidence shows a relationship between the consumption of the food or drink and one or more of the following:

- a healthy diet,
- protective factors for diet-related disease, and
- positive diet-related health outcomes and wellbeing.

Therefore the evidence presented in this systematic review supports the definitions of 'discretionary' food and drinks and 'unhealthy' food and drinks below.

'Unhealthy' food and drinks are defined as those for which the best available epidemiological evidence shows a relationship between the consumption of the food or drink and one or more of the following:

- a poor diet,
- risk factors for diet-related disease, and
- adverse diet-related health outcomes.

[44] Non-starchy vegetables are the one food group which most stakeholders, sectors and consumers agree is 'healthy'.

As the most promising term for ‘discretionary’ food and drinks and synonyms is ‘unhealthy’ food and drinks, the definition of ‘discretionary’ food and drinks is as below.

‘Discretionary’ food and drinks are defined as ‘unhealthy’ food and drinks that are not essential components of a healthy diet and for which the best available epidemiological evidence shows a relationship between the consumption of the food or drink and one or more of the following:

- a poor diet,
- risk factors for diet-related disease, and
- adverse diet-related health outcomes.

7.3.3. Promising food classification systems to provide context for recommended term and definition of unhealthy food and drinks

Of the 13 different food classification systems identified in this project, across all policy and practice applications, ‘unhealthy’ food and drinks is potentially defined most promisingly in four key food classification systems:

- nutrient profiling systems where both specific, validated nutrient- and system- cut-points are provided across food categories as well as within food categories, and ‘unhealthy’ food and drinks are clearly distinguished (for example, by warning labels on foods);
- food based dietary guidelines, such as the Australian Dietary Guidelines;
- systems based on degree of food processing, such as the NOVA classification; and
- application of multiple definitions of ‘unhealthy’ food and drinks, most commonly a mix of food-based dietary guidelines and a nutrient-profiling system.

Considering the need, implications and limitations of each potential approach in the context of rapid international developments around specification of the terms, definition and context of ‘unhealthy’ food and drinks identified in the review, it is recommended that further consideration be given to all four approaches.

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7.4. Evidence and next steps

7.4.1. Need for revision of the Australian Dietary Guidelines 2013

Consideration of four promising food classification systems to provide context for the recommended term and definition of 'unhealthy' food and drinks is a non-trivial task, particularly as nutrition science is constantly evolving. Interrogating the strengths and limitations of the four approaches requires advanced nutrition epidemiology and technical knowledge, skills and abilities. However, as the literature reviews that informed the ADGs are now 10 years old, and all 'unhealthy' and 'healthy' food and drinks are related intrinsically in their contribution to dietary patterns (the dominant exposure variable in diet-related health), it is imperative that this work is conducted within the context of broader review of the ADGs.

Further, the evidence from these systematic reviews (Phase One and Phase Two) illustrates clearly that best practice governance and consultation structures, such as those characteristic of NHMRC internal guideline processes, are required to progress such work efficiently and effectively.

7.4.2. Need for promotion and marketing of the terms and definitions of 'healthy' and 'unhealthy' food and drinks

This review has shown clearly that different food classification systems are best suited to different policy and practice applications. However, as a major challenge is increasing community awareness, knowledge, skills and abilities to discern 'healthy' and 'unhealthy' food and drinks, there is an inherent limitation in adopting more than one system requiring explanation, marketing and promotion, with potentially contradictory messaging and competition for resourcing. For example, this review identified views that extensive promotion of the HSR food labelling system in Australia was dominating, confusing and potentially undermining the more limited official communication around ADGs recommendations.

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7.4.3. Potential interim approach

Poor diet as a whole is now the leading risk factor contributing to burden of disease globally and in Australia [14] and so urgent action is required. Therefore, the time required for considered assessment of the merits of all four approaches is potentially problematic. However, a potential interim approach could be the transparent development based on the best available scientific and epidemiological evidence, and publication and promotion of an agreed list of 'unhealthy' and 'healthy' food and drinks defined by a multi-definition system with input from all stakeholders, excluding those with commercial interests.

Justification for such an approach is supported by the utility and relative acceptance of the searchable food list developed by the ATO for Australian GST purposes [121], the 'discretionary' food list developed by the ABS [16], and the list of 'healthy' foods used to develop weight estimates of the composite food groups used in the modelling to inform the revision of the Australian Guide to Healthy Eating [112]. Although these current executions have their flaws and/or are relatively dated, potentially they could be used as a basis for further development.

Indeed, the report of the five year review of the health star rating system in Australia and New Zealand [122] points to a current review by the NHMRC[45] of the 'discretionary' food list developed by the ABS [16], which could provide a potential platform for such an approach.

7.4.4. Need for a robust evidence-based scientific approach

A key requirement for an enduring, fit-for-purpose definition of 'unhealthy' food and drinks and food classification system is that the approach must be validated directly against dietary impacts, risk factors and health outcomes. The food system is complex, and unintended consequences can be highly problematic. In particular, the value of any system that identifies relatively 'less unhealthy' foods and inadvertently promotes consumption of these, rather than identifying 'unhealthy' food and drinks to avoid and 'healthy' food and drinks to promote, should be questioned. This is an inherent risk with nutrient profiling systems that place foods on relative spectrum of 'healthiness' within food categories, and, to a lesser extent, also with categorisation of some foods under some systems based on degree of food processing.[46]

To help minimise such risks, one promising recent policy action identified in this review is the use of "warning labels" on 'unhealthy' food and drinks. This approach is particularly relevant to identify 'unhealthy' choices identified by application of system-level cut-points to nutrient profiling systems. However, it could also be adapted for application to 'unhealthy' food and drinks as defined by dietary guidelines, NOVA and/or mixed approach systems.

Consideration should also be focused on contemporary evidence that it is the whole food, rather than any specific nutrient or component that is the exposure determinant of diet-related health outcomes. In particular, there is a growing body of evidence that interactions in whole foods between nutrients, other food components, mechanisms of food processing and the food matrix itself need further consideration when determining whether a food is 'unhealthy' or 'healthy', and hence application of any nutrient/food component level cut-off points particularly requires careful interrogation.

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7.5. Concluding remarks

As requested, this unique project has systematically reviewed peer-reviewed and grey literature nationally and internationally to identify and examine current practice around classification of 'unhealthy' food and drinks, and to determine the implications and limitations across various settings and policy environments of providing a definition/s for 'discretionary food and drinks' via nutrient/food component level cut-points, prescriptive definitions, or both, while reflecting the operationally intended purpose of the Australian Dietary Guidelines.

Using a systematic approach and novel synthesis and analysis methods, the project has proposed to define 'discretionary food and drinks' using the term 'unhealthy' food and drinks, formulated a definition and identified promising food classification systems and a potential way forward for further consideration by NHMRC and its Expert Working Group.

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[45] The review team could not confirm the existence or scope of any such review to produce a Discretionary Food and Drinks list.
[46] For example, sugar is not classified as 'ultra-processed' in the NOVA system, but would be considered 'unhealthy' by most Australian stakeholders and consumers.

Appendices

Appendix 1A	Details of final search protocol (not included in body of report)
Appendix 1B	Results of pilot search
Appendix 2A	Table of detailed data extraction from peer-reviewed reviews
Appendix 2B	Table of detailed data extraction from international websites
Appendix 2C	Table of detailed data extraction from national websites
Appendix 3A	Table A3.1. Summary data extraction provided as supplementary table by Labonte et al (2018)
Appendix 3B	Table A3.2. Full details of data extraction by Labonte et al (2018) sent to research team
Appendix 4A	Reordered data extraction table for 'unhealthy' food and drinks in the peer reviewed reviews
Appendix 4B	Reordered data extraction table for 'unhealthy' food and drinks in the international websites
Appendix 4C	Reordered data extraction table for 'unhealthy' food and drinks in the national websites
Appendix 5A	Reordered data extraction table for 'healthy' food and drinks in the peer reviewed reviews
Appendix 5B	Reordered data extraction table for 'healthy' food and drinks in the international websites
Appendix 5C	Reordered data extraction table for 'healthy' food and drinks in the national websites
Appendix 6	The NOVA food classification system and its four groups defined according to the extent and purpose of food processing, from report by Monteiro et al (2019)

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Appendix 1A Details of final search protocol (not included in body of report)

Literature and website search methods

The research questions, methods and search strategies for Part A, the extensive literature and website search, are outlined in Section 4. Supplementary detail is provided here.

Search terms and processes for literature and website searches

Table A1Ai: Detailed search terms and index categories used in peer-reviewed literature search

Terms for healthy or unhealthy food & drinks		Terms for nutrition policy actions		Terms for in-scope countries		Terms for limiting clinical applications
Healthy food OR Unhealthy food OR Discretionary food OR Occasional food OR Sometimes food OR Ultra-processed food OR NOVA OR Prepared food OR Highly processed food OR Processed food OR Food prepared outside the home OR Extra food OR Junk food OR Energy dense nutrient poor food OR Empty calorie food OR Non-core food OR Sugar sweetened beverage* OR Beverage guidance system OR Core food OR Five food group OR Classification of foods and drinks OR nutritional criteria OR nutrition criteria OR nutrient profile OR nutrient profiling OR nutrient score OR nutri* score OR Sugary drinks OR keyhole OR Fast food (index term) OR Snacks (index term)	AND	policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim OR Nutrition policy (index term)	AND	Austria OR Austrian OR Belgium OR Belgian OR Canada OR Canadian OR Chile OR Chilean OR Czech Republic OR Czech OR Denmark OR Danish OR Estonia OR Estonian OR Finland OR Finnish OR France OR French OR Germany OR German OR Greece OR Greek OR Hungary OR Hungarian OR Iceland OR Icelandic OR Ireland OR Irish OR Israel OR Israeli OR Italy OR Italian OR Japan OR Japanese OR Korea OR Korean OR Luxembourg OR Luxembourgian OR Mexico OR Mexican OR Netherlands OR Dutch OR New Zealand OR New Zealander OR Norway OR Norwegian OR Poland OR Polish OR Portugal OR Portuguese OR Slovenia OR Spain OR Spanish OR Sweden OR Swedish OR Switzerland OR Swiss OR Turkey OR Turkish OR United Kingdom OR UK OR English OR United States OR US OR American OR Brazil OR Brazilian OR South Africa OR South African OR French Polynesia OR Argentina OR Argentinian OR Singapore OR Ghana OR European OR Scandinavian OR South American OR South America OR Latin America OR developed country OR developed countries	NOT	(clinical OR laboratory) (smoking OR tobacco) (zinc OR iron OR calcium OR vitamin OR micronutrient)

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Limiters applied to each database search:

- Publication date: January 2009 - 2019
- Publication type: review (including systematic review, critical review, narrative review)
- English language
- Abstract available
- Humans (not animals).

Each database had slightly different interface options and limiter options, but wherever possible the exact search strategy listed above was applied (and if a limiter was not available it was noted). Resulting citations were downloaded into EndNote X9. Duplicates were removed by either: the automatic process EndNote applies when identifying exact matched citations; or through a thorough

hand search to identify duplicates that had slightly different formatting (not recognised automatically by EndNote). Citations with "Australia/n" in the title were identified and screened out if the citation solely focused on the Australian context. The criteria listed below were systematically applied to all remaining citations; based on title, then if required the abstract. Full texts were downloaded for all citations remaining after the title and abstract screening, and the same criteria were applied.

Inclusion and exclusion criteria are listed in Section 4.2.1.

Search terms and processes for websites

The search terms and processes for websites are described at 4.2.1.12.

Due to limited search results from the systematic term-based search, some websites were also hand searched for relevant webpages. The hand search relied on the websites menu items to navigate to pages related to nutrition policy actions. In addition to searching the national-level websites, the NOURISHING database (https://www.wcrf.org/int/policy/nourishing-database) was searched for entries related to each in-scope country.

Each webpage was screened using the following inclusion and exclusion criteria:

Inclusion criterion

- Any webpage with a primary aim that is to provide a definition that distinguishes 'healthy' and 'unhealthy' food and/or drinks or their synonyms; or applies a definition that distinguishes healthy and unhealthy foods as a tool, strategy, criterion or guidance to improve diet and/or health

Exclusion criteria

- Any peer-reviewed journal article (as these were the focus in the database search)
- Any webpage not updated since 2009
- Any webpage with a primary aim that is to investigate the relationship between foods, food groups or dietary patterns and health, wellness or specific medical conditions, including obesity
- Any webpage with a primary aim that is to describe trends in consumption patterns of foods and food groups, that does not define or differentiate between 'healthy' and 'unhealthy' food and drinks or their synonyms
- Any webpage that deals primarily with the assessment of the 'healthiness' of diets and dietary patterns, rather than the composite foods and/or drinks, such as dietary indexes[47]
- Any webpage that does not define or differentiate between 'healthy' and 'unhealthy' food and drinks or their synonyms.

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Data extraction

The data extraction process is summarised at 4.3.

[47] Such as Ward et al 2019 [148] and McNaughton et al 2009 [149].

Table A1Aii: Fields extracted from included sources in each search

Search	Data extraction fields
Peer-reviewed literature search	First Author, Year, Country of First Author, All Authors, Funding of research, Declared conflicts of interest, Article Title, Journal Title, Type of review, Countries in review scope, Aim of review, NOURISHING-M&S action areas, Term for "healthy foods", Definition of term for "healthy foods", Source of definition for term for "healthy foods", Intent or application of definition of "healthy foods", Term for "unhealthy foods", Definition of term for "unhealthy foods", Source of definition for term for "unhealthy foods", Intent or application of definition of "unhealthy foods", Categories for sorting definitions, Definitions extracted from original papers?, Key conclusions of review, Type of search conducted, Number of papers reviewed, Evaluation discussed in text?, Meta-analysis findings (if applicable), Evaluation information extracted from original papers?, Secondary Term for "healthy foods", Secondary Definition of term for "healthy foods", Secondary Source of definition for term for "healthy foods", Secondary Intent or application of definition of "healthy foods", Secondary Term for "unhealthy foods", Secondary Definition of term for "unhealthy foods", Secondary Source of definition for term for "unhealthy foods", Secondary Intent or application of definition of "unhealthy foods"
International-level websites search	Name of Organisation, URL, Date searched, Search structure: search term, Resulting pages (screened pages), Eligible pages, Title of webpage, URL of webpage, Date webpage was last reviewed/updated, Webpage purpose, NOURISHING -M&S action, Term for "healthy foods", Definitior of term for "healthy foods", Source of definition for term for "healthy foods", Intent or application of definition of "healthy foods", Term for "unhealthy foods", Definition of term for "unhealthy foods", Source of definition for term for "unhealthy foods", Intent or application of definition of "unhealthy foods", Key statement about healthy/unhealthy foods related to the definition, Evaluation mentioned on webpage?, Secondary Term for "healthy foods", Secondary Definition of term for "healthy foods", Secondary Source of definition for term for "healthy foods", Secondary Intent or application of definition of "healthy foods", Secondary Term for "unhealthy foods", Secondary Definition of term for "unhealthy foods", Secondary Source of definition for term for "unhealthy foods", Secondary Intent or application of definition of "unhealthy foods"
National-level websites search	Country of Organisation, Name of Organisation responsible for Dietary Guidelines, Name of Dietary Guidelines, Year of most recent Guideline, Food Guide Overview, Key Dietary Guideline Messages, URL of organisation, Date searched, Language, Search structure: search term, Resulting pages (screened pages), Eligible pages, Title of webpage, URL of webpage, Date webpage was last reviewed/updated, Webpage purpose, NOURISHING-M&S action, Term for "healthy foods", Definition of term for "healthy foods", Source of definition for term for "healthy foods", Intent or application of definition of "healthy foods", Term for "unhealthy foods", Definition of term for "unhealthy foods", Source of definition for term for "unhealthy foods", Intent or application of definition of "unhealthy foods", Key statement about healthy/unhealthy foods related to the definition, Evaluation mentioned on webpage?, Secondary Term for "healthy foods", Secondary Definition of term for "healthy foods", Secondary Source of definition for term for "healthy foods", Secondary Intent or application of definition of "healthy foods", Secondary Term for "unhealthy foods", Secondary Definition of term for "unhealthy foods", Secondary Source of definition for term for "unhealthy foods", Secondary Intent or application of definition of "unhealthy foods"

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To help understand the context of the research being conducted and to align this scoping review with the methods used in the Scoping Study for a new National Nutrition Policy in Australia [17], we coded articles as addressing one or more of the NOURISHING framework action areas. This framework was developed by the World Cancer Research Fund International and has been extended to include the action areas of “Monitoring and Surveillance” (see Table 3) based on the work by Professor Lee and colleagues.[48]

To provide context for the analysis of the nutrition policy actions, we also extracted information about each country’s national dietary guidelines. The UN’s Food and Agriculture Organisation (http://www.fao.org/home/en/) keeps an up-to-date record of all food-based dietary guidelines, so this was used as the data source for guideline information.

[48] Note: this approach is based on gap analysis of the scoping study for a new nutrition policy in Australia (Lee et al 2013); details will be provided in the final report.

Table A1Aiii: Adapted version of the NOURISHING framework

	Category Description	Examples of types of actions
N	Nutrition label standards and regulations on the use of claims and implied claims on food	• Mandatory nutrient lists on packaged food
		• Clearly visible "interpretative" labels and warning labels
		• On-shelf labelling
		• Calorie & nutrient labelling on menus and displays in out-of-home venues
		• Warning labels on menus and displays in out-of-home venues
		• Rules on nutrient claims (ie nutrient content)
		• Rules on health claims (ie disease risk reduction claims)
O	Offer healthy food and set standards in public institutions and other specific settings	• Fruit & vegetable initiatives in schools
		• Standards for food available in schools, including restrictions on unhealthy food
		• Bans specific to vending machines in schools
		• Standards in social support programmes
		• Standards in other specific locations (e.g. health facilities, workplace)
U	Use economic tools to address food affordability and purchase incentives	• Health-related food taxes
		• Increasing import tariffs on specified 'unhealthy' food
		• Lowering import tariffs on specified 'healthy' food
		• Targeted subsidies for healthy food
R	Restrict food advertising and other forms of commercial promotion	• Mandatory regulation of broadcast food advertising to children
		• Mandatory regulation of food advertising on non-broadcast communications channels
		• Mandatory regulation of food advertising through any medium
		• Mandatory regulation of specific marketing techniques
		• Mandatory regulation of marketing of specific food items and beverages
		• Mandatory regulation of food marketing in schools
		• Mandatory requirement that advertisements must carry a health message or warning
I	Improve nutritional quality of the whole food supply	• Reformulation of food products
		• Commitments to reduce portion sizes
		• Limits on level of salt in food products
		• Limits on availability of certain "high in" foods
S	Set incentives and rules to create a healthy retail and food service environment	• Incentives and rules for stores to locate in under-served neighbourhoods
		• Initiatives to increase the availability of healthier food in stores and food service outlets
		• Incentives and rules to reduce trans fat in food service outlets
		• Incentives and rules to offer healthy food options as a default in food service outlets
		• Incentives and rules to restrict SSB consumption in food service outlets
		• Incentives and rules to reduce salt in food service outlets
		• Planning restrictions on food outlets
H	Harness food supply chain and actions across sectors to ensure coherence with health	• Working with food suppliers to provide healthier ingredients
		• Nutrition standards for public procurement
		• Public procurement through "short" chains (e.g. local farmers)

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		• Supply chain incentives for food production
		• Supporting urban agriculture in health and planning policies
I(2)	Inform people about food and nutrition through public awareness	• Development and communication of food-based dietary guidelines
		• Development and communication of guidelines for specific food groups
		• Public awareness, mass media and social marketing on healthy eating
N(2)	Nutrition advice and counselling in healthcare settings	• Guidelines and programmes to provide support in primary care to people who are overweight and obese
		• Nutrition counselling in primary care
		• Training for health professionals
G	Give nutrition education and skills	• Nutrition education on curricula
		• Community-based nutrition education
		• Cooking skills
		• Initiatives to train school children on growing food
		• Training for chefs, caterers and food service providers
M&S	Monitoring and surveillance of nutrition actions	• Monitoring and surveillance of dietary intake
		• Monitoring and surveillance of diet-related health outcomes
		• Monitoring and surveillance of food environments
		• Monitoring and surveillance of nutrition policy actions

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A1A.2. Database search yields

Table A1Aiv: Database search yields by individual databases (searches conducted on 27 May 2019)

Database	Resulting citations	After limiters
The Cochrane Library	316	58
PubMed	1,516	88
MEDLINE	1,482	104
EMBASE	3,189	121
CINAHL	880	46
Scopus	262	29
DoPHER	23*	23*
TRoPHI	30*	30*
ERIC	68	1
Web of Science	10,365	512
Total imported		1012
Duplicates removed		796 (216 removed)
Australian focus (based on title) removed		791 (5 removed)
To be screened		791

*Country cluster not included in search terms due to small pool of citations; only limiter option available through database interface was year of publication

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A1A.3. Actual searches as entered in databases

PubMed

Search (((((((((Healthy food[Title/Abstract] OR Unhealthy food[Title/Abstract] OR Discretionary food[Title/Abstract] OR Occasional food[Title/Abstract] OR Sometimes food[Title/Abstract] OR Ultra processed food[Title/Abstract] OR NOVA[Title/Abstract] OR Prepared food[Title/Abstract] OR Highly processed food[Title/Abstract] OR Processed food[Title/Abstract] OR Food prepared outside the home[Title/Abstract] OR Extra food[Title/Abstract] OR Junk food[Title/Abstract] OR Energy dense nutrient poor food[Title/Abstract] OR Empty calorie food[Title/Abstract] OR Non-core food[Title/Abstract] OR Sugar sweetened beverage[Title/Abstract] OR Beverage guidance system[Title/Abstract] OR Core food[Title/Abstract] OR Five food group[Title/Abstract] OR Classification of foods drink[Title/Abstract] OR nutritional criteria[Title/Abstract] OR nutrition criteria[Title/Abstract] OR nutrient profile[Title/Abstract] OR nutrient profiling[Title/Abstract] OR nutrient score[Title/Abstract] OR nutrient score[Title/Abstract] OR nutrition score[Title/Abstract] OR sugary drinks[Title/Abstract] OR keyhole[Title/Abstract]))) OR ((snacks OR fast food[MeSH Terms]))))) AND ((((policy[Title/Abstract] OR policies[Title/Abstract] OR strategy[Title/Abstract] OR strategies[Title/Abstract] OR label[Title/Abstract] OR labelling[Title/Abstract] OR labeling[Title/Abstract] OR rating[Title/Abstract] OR fortification[Title/Abstract] OR advertising[Title/Abstract] OR advertise[Title/Abstract] OR claim[Title/Abstract])))) OR nutrition policy[MeSH Terms])) AND ((Austria[Title/Abstract] OR Austrian[Title/Abstract] OR Belgium[Title/Abstract] OR Belgian[Title/Abstract] OR Canada[Title/Abstract] OR Canadian[Title/Abstract] OR Chile[Title/Abstract] OR Chilean[Title/Abstract] OR Czech Republic[Title/Abstract] OR Czech[Title/Abstract] OR Denmark[Title/Abstract] OR Danish[Title/Abstract] OR Estonia[Title/Abstract] OR Estonian[Title/Abstract] OR Finland[Title/Abstract] OR Finnish[Title/Abstract] OR France[Title/Abstract] OR French[Title/Abstract] OR Germany[Title/Abstract] OR German[Title/Abstract] OR Greece[Title/Abstract] OR Greek[Title/Abstract] OR Hungary[Title/Abstract] OR Hungarian[Title/Abstract] OR Iceland[Title/Abstract] OR Icelandic[Title/Abstract] OR Ireland[Title/Abstract] OR Irish[Title/Abstract] OR Israel[Title/Abstract] OR Israeli[Title/Abstract] OR Italy[Title/Abstract] OR Italian[Title/Abstract] OR Japan[Title/Abstract] OR Japanese[Title/Abstract] OR Korea[Title/Abstract] OR Korean[Title/Abstract] OR Luxembourg[Title/Abstract] OR Luxembourgian[Title/Abstract] OR Mexico[Title/Abstract] OR Mexican[Title/Abstract] OR Netherlands[Title/Abstract] OR Dutch[Title/Abstract] OR New Zealand[Title/Abstract] OR New Zealander[Title/Abstract] OR Norway[Title/Abstract] OR Norwegian[Title/Abstract] OR Poland[Title/Abstract] OR Polish[Title/Abstract] OR Portugal[Title/Abstract] OR Portuguese[Title/Abstract] OR Slovak Republic[Title/Abstract] OR Slovak[Title/Abstract] OR Slovenia[Title/Abstract] OR Spain[Title/Abstract] OR Spanish[Title/Abstract] OR Sweden[Title/Abstract] OR Swedish[Title/Abstract] OR Switzerland[Title/Abstract] OR Swiss[Title/Abstract] OR Turkey[Title/Abstract] OR Turkish[Title/Abstract] OR United Kingdom[Title/Abstract] OR UK[Title/Abstract] OR English[Title/Abstract] OR United States[Title/Abstract] OR US[Title/Abstract] OR American[Title/Abstract] OR Brazil[Title/Abstract] OR Brazilian[Title/Abstract] OR South Africa[Title/Abstract] OR South African[Title/Abstract] OR French Polynesia[Title/Abstract] OR Argentina[Title/Abstract] OR Argentinian[Title/Abstract] OR Singapore[Title/Abstract] OR Ghana[Title/Abstract] OR European[Title/Abstract] OR Scandinavian[Title/Abstract] OR South American[Title/Abstract] OR South America[Title/Abstract] OR Latin America[Title/Abstract] OR developed country[Title/Abstract] OR developed countries[Title/Abstract]))) NOT ((clinical[Title/Abstract] OR laboratory[Title/Abstract]))) NOT ((smoking[Title/Abstract] OR tobacco[Title/Abstract]))) NOT ((zinc[Title/Abstract] OR iron[Title/Abstract] OR calcium[Title/Abstract] OR vitamin[Title/Abstract] OR micronutrient[Title/Abstract]))

Filters activated: Review, Abstract, Publication date from 2009/01/01 to 2019/12/31, Humans, English.

EMBASE

No.	Query
#15	#14 NOT #13
#14	#11 NOT #12
#13	zinc:ab,ti OR iron:ab,ti OR calcium:ab,ti OR vitamin:ab,ti OR micronutrient:ab,ti
#12	tobacco:ab,ti OR smoking:ab,ti
#11	#9 NOT #10
#10	clinical:ab,ti OR laboratory:ab,ti
#9	#4 AND #7 AND #8
#8	#5 OR #6
#7	austria:ab,ti OR austrian:ab,ti OR belgium:ab,ti OR belgian:ab,ti OR canada:ab,ti OR canadian:ab,ti OR chile:ab,ti OR chilean:ab,ti OR 'czech republic':ab,ti OR czech:ab,ti OR denmark:ab,ti OR danish:ab,ti OR estonia:ab,ti OR estonian:ab,ti OR finland:ab,ti OR finnish:ab,ti OR france:ab,ti OR french:ab,ti OR germany:ab,ti OR german:ab,ti OR greece:ab,ti OR greek:ab,ti OR hungary:ab,ti OR hungarian:ab,ti OR iceland:ab,ti OR icelandic:ab,ti OR ireland:ab,ti OR irish:ab,ti OR israel:ab,ti OR israeli:ab,ti OR italy:ab,ti OR italian:ab,ti OR japan:ab,ti OR japanese:ab,ti OR korea:ab,ti OR korean:ab,ti OR luxembourg:ab,ti OR luxembourgian:ab,ti OR mexico:ab,ti OR mexican:ab,ti OR netherlands:ab,ti OR dutch:ab,ti OR 'new zealand':ab,ti OR 'new zealander':ab,ti OR norway:ab,ti OR norwegian:ab,ti OR poland:ab,ti OR polish:ab,ti OR portugal:ab,ti OR portuguese:ab,ti OR 'slovak republic':ab,ti OR slovak:ab,ti OR slovenia:ab,ti OR spain:ab,ti OR spanish:ab,ti OR sweden:ab,ti OR swedish:ab,ti OR switzerland:ab,ti OR swiss:ab,ti OR turkey:ab,ti OR turkish:ab,ti OR 'united kingdom':ab,ti OR uk:ab,ti OR english:ab,ti OR 'united states':ab,ti OR us:ab,ti OR american:ab,ti OR brazil:ab,ti OR brazilian:ab,ti OR 'south africa':ab,ti OR 'south african':ab,ti OR 'french polynesia':ab,ti OR argentina:ab,ti OR argentinian:ab,ti OR singapore:ab,ti OR ghana:ab,ti OR european:ab,ti OR scandinavian:ab,ti OR south american:ab,ti OR south america:ab,ti OR latin america:ab,ti OR 'developed country':ab,ti OR 'developed countries':ab,ti
#6	policy:ab,ti OR policies:ab,ti OR strategy:ab,ti OR strategies:ab,ti OR label:ab,ti OR labelling:ab,ti OR labeling:ab,ti OR rating:ab,ti OR fortification:ab,ti OR advertising:ab,ti OR advertise:ab,ti OR claim:ab,ti
#5	'nutrition policy'/de
#4	#1 OR #2 OR #3
#3	'snacks'/de
#2	'fast food'/de
#1	('healthy food':ab,ti OR 'unhealthy food':ab,ti OR 'discretionary food':ab,ti OR 'occasional food':ab,ti OR 'sometimes food':ab,ti OR 'ultra-processed food':ab,ti OR 'ultra processed food':ab,ti OR 'nova':ab,ti OR 'prepared food':ab,ti OR 'highly processed food':ab,ti OR 'processed food':ab,ti OR 'food prepared outside the home':ab,ti OR 'extra food':ab,ti OR 'junk food':ab,ti OR 'energy dense nutrient poor food':ab,ti OR 'empty calorie food':ab,ti OR 'non-core food':ab,ti OR 'sugar sweetened beverage':ab,ti OR 'beverage guidance system':ab,ti OR 'core food':ab,ti OR 'five food group':ab,ti OR 'classification of foods':ab,ti) AND drinks:ab,ti OR 'nutritional criteria':ab,ti OR 'nutrition criteria':ab,ti OR 'nutrient profile':ab,ti OR 'nutrient profiling':ab,ti OR 'nutrition score':ab,ti OR 'nutrient score':ab,ti OR 'sugary drinks':ab,ti OR keyhole:ab,ti

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Web of Science

# 5	3,389	#4 AND #3 AND #1 *Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years*	Edit
# 4	6,382,892	TS=(Austria OR Austrian OR Belgium OR Belgian OR Canada OR Canadian OR Chile OR Chilean OR Czech Republic OR Czech OR Denmark OR Danish OR Estonia OR Estonian OR Finland OR Finnish OR France OR French OR Germany OR German OR Greece OR Greek OR Hungary OR Hungarian OR Iceland OR Icelandic OR Ireland OR Irish OR Israel OR Israeli OR Italy OR Italian OR Japan OR Japanese OR Korea OR Korean OR Luxembourg OR Luxembourgian OR Mexico OR Mexican OR Netherlands OR Dutch OR New Zealand OR New Zealander OR Norway OR Norwegian OR Poland OR Polish OR Portugal OR Portuguese OR Slovak Republic OR Slovak OR Slovenia OR Spain OR Spanish OR Sweden OR Swedish OR Switzerland OR Swiss OR Turkey OR Turkish OR United Kingdom OR UK OR English OR United States OR US OR American OR Brazil OR Brazilian OR South Africa OR South African OR French Polynesia OR Argentina OR Argentinian OR Singapore OR Ghana	Edit

		OR European OR Scandinavian OR South American OR South America OR Latin America OR "developed country" OR "developed countries") *Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years*	
# 3	7,222,189	TS=(policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim) *Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years*	Edit
# 1	38,540	TS=("Healthy food" OR "Unhealthy food" OR "Discretionary food" OR "Occasional food" OR "Sometimes food" OR "Ultra-processed food" OR "ultra processed food" OR "NOVA" OR "Prepared food" OR "Highly processed food" OR "Processed food" OR "Food prepared outside the home" OR "Extra food" OR "Junk food" OR "Energy dense nutrient poor food" OR "Empty calorie food" OR "Non-core food" OR "Sugar sweetened beverage" OR "Beverage guidance system" OR "Core food" OR "Five food group" OR "Classification of foods and drinks" OR "nutritional criteria" OR "nutrition criteria" OR "nutrient profile" OR "nutrient profiling" OR "nutrition score" OR "nutrient score" OR "sugary drinks" OR keyhole) *Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years*	

MEDLINE

S9	S4 AND S7 AND S8
S8	AB (Austria OR Austrian OR Belgium OR Belgian OR Canada OR Canadian OR Chile OR Chilean OR Czech Republic OR Czech OR Denmark OR Danish OR Estonia OR Estonian OR Finland OR Finnish OR France OR French OR Germany OR German OR Greece OR Greek OR Hungary OR Hungarian OR Iceland OR Icelandic OR Ireland OR Irish OR Israel OR Israeli OR Italy OR Italian OR Japan OR Japanese OR Korea OR Korean OR Luxembourg OR Luxembourgian OR Mexico OR Mexican OR Netherlands OR Dutch OR New Zealand OR New Zealander OR Norway OR Norwegian OR Poland OR Polish OR Portugal OR Portuguese OR Slovak Republic OR Slovak OR Slovenia OR Spain OR Spanish OR Sweden OR Swedish OR Switzerland OR Swiss OR Turkey OR Turkish OR United Kingdom OR UK OR English OR United States OR US OR American OR Brazil OR Brazilian OR South Africa OR South African OR French Polynesia OR Argentina OR Argentinian OR Singapore OR Ghana OR European OR Scandinavian OR South American OR South America OR Latin America OR 'developed country' OR 'developed countries') OR TI (Austria OR Austrian OR Belgium OR Belgian OR Canada OR Canadian OR Chile OR Chilean OR Czech Republic OR Czech OR Denmark OR Danish OR Estonia OR Estonian OR Finland OR Finnish OR France OR French OR Germany OR German OR Greece OR Greek OR Hungary OR Hungarian OR Iceland OR Icelandic OR Ireland OR Irish OR Israel OR Israeli OR Italy OR Italian OR Japan OR Japanese OR Korea OR Korean OR Luxembourg OR Luxembourgian OR Mexico OR Mexican OR Netherlands OR Dutch OR New Zealand OR New Zealander OR Norway OR Norwegian OR Poland OR Polish OR Portugal OR Portuguese OR Slovak Republic OR Slovak OR Slovenia OR Spain OR Spanish OR Sweden OR Swedish OR Switzerland OR Swiss OR Turkey OR Turkish OR United Kingdom OR UK OR English OR United States OR US OR American OR Brazil OR Brazilian OR South Africa OR South African OR French Polynesia OR Argentina OR Argentinian OR Singapore OR Ghana OR European OR Scandinavian OR South American OR South America OR Latin America OR 'developed country' OR 'developed countries')
S7	S5 OR S6
S6	SU nutrition policy
S5	TI (policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim) OR AB (policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim)
S4	S1 OR S2 OR S3
S3	SU snacks
S2	SU fast food

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S1	TI (“Healthy food” OR “Unhealthy food” OR “Discretionary food” OR “Occasional food” OR “Sometimes food” OR “Ultra-processed food” OR “ultra processed food” OR “NOVA” OR “Prepared food” OR “Highly processed food” OR “Processed food” OR “Food prepared outside the home” OR “Extra food” OR “Junk food” OR “Energy dense nutrient poor food” OR “Empty calorie food” OR “Non-core food” OR “Sugar sweetened beverage” OR “Beverage guidance system” OR “Core food” OR “Five food group” OR “Classification of foods and drinks” OR “nutritional criteria” OR “nutrition criteria” OR “nutrient profile” OR “nutrient profiling” OR “nutrition score” OR “nutrient score” OR “sugary drinks” OR keyhole) OR AB (“Healthy food” OR “Unhealthy food” OR “Discretionary food” OR “Occasional food” OR “Sometimes food” OR “Ultra-processed food” OR “ultra processed food” OR “NOVA” OR “Prepared food” OR “Highly processed food” OR “Processed food” OR “Food prepared outside the home” OR “Extra food” OR “Junk food” OR “Energy dense nutrient poor food” OR “Empty calorie food” OR “Non-core food” OR “Sugar sweetened beverage” OR “Beverage guidance system” OR “Core food” OR “Five food group” OR “Classification of foods and drinks” OR “nutritional criteria” OR “nutrition criteria” OR “nutrient profile” OR “nutrient profiling” OR “nutrition score” OR “nutrient score” OR “sugary drinks” OR keyhole)

CINAHL

S9	S4 AND S7 AND S8
S8	AB (Austria OR Austrian OR Belgium OR Belgian OR Canada OR Canadian OR Chile OR Chilean OR Czech Republic OR Czech OR Denmark OR Danish OR Estonia OR Estonian OR Finland OR Finnish OR France OR French OR Germany OR German OR Greece OR Greek OR Hungary OR Hungarian OR Iceland OR Icelandic OR Ireland OR Irish OR Israel OR Israeli OR Italy OR Italian OR Japan OR Japanese OR Korea OR Korean OR Luxembourg OR Luxembourgian OR Mexico OR Mexican OR Netherlands OR Dutch OR New Zealand OR New Zealander OR Norway OR Norwegian OR Poland OR Polish OR Portugal OR Portuguese OR Slovak Republic OR Slovak OR Slovenia OR Spain OR Spanish OR Sweden OR Swedish OR Switzerland OR Swiss OR Turkey OR Turkish OR United Kingdom OR UK OR English OR United States OR US OR American OR Brazil OR Brazilian OR South Africa OR South African OR French Polynesia OR Argentina OR Argentinian OR Singapore OR Ghana OR European OR Scandinavian OR South American OR South America OR Latin America OR ‘developed country’ OR ‘developed countries’) OR TI (Austria OR Austrian OR Belgium OR Belgian OR Canada OR Canadian OR Chile OR Chilean OR Czech Republic OR Czech OR Denmark OR Danish OR Estonia OR Estonian OR Finland OR Finnish OR France OR French OR Germany OR German OR Greece OR Greek OR Hungary OR Hungarian OR Iceland OR Icelandic OR Ireland OR Irish OR Israel OR Israeli OR Italy OR Italian OR Japan OR Japanese OR Korea OR Korean OR Luxembourg OR Luxembourgian OR Mexico OR Mexican OR Netherlands OR Dutch OR New Zealand OR New Zealander OR Norway OR Norwegian OR Poland OR Polish OR Portugal OR Portuguese OR Slovak Republic OR Slovak OR Slovenia OR Spain OR Spanish OR Sweden OR Swedish OR Switzerland OR Swiss OR Turkey OR Turkish OR United Kingdom OR UK OR English OR United States OR US OR American OR Brazil OR Brazilian OR South Africa OR South African OR French Polynesia OR Argentina OR Argentinian OR Singapore OR Ghana OR European OR Scandinavian OR South American OR South America OR Latin America OR ‘developed country’ OR ‘developed countries’)
S7	S5 OR S6
S6	SU nutrition policy
S5	TI (policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim) OR AB (policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim)
S4	S1 OR S2 OR S3
S3	SU snacks
S2	SU fast food
S1	TI (“Healthy food” OR “Unhealthy food” OR “Discretionary food” OR “Occasional food” OR “Sometimes food” OR “Ultra-processed food” OR “ultra processed food” OR “NOVA” OR “Prepared food” OR “Highly processed food” OR “Processed food” OR “Food prepared outside the home” OR “Extra food” OR “Junk food” OR “Energy dense nutrient poor food” OR “Empty calorie food” OR “Non-core food” OR “Sugar sweetened beverage” OR “Beverage guidance system” OR “Core food” OR “Five food group” OR “Classification of foods and drinks” OR “nutritional criteria” OR “nutrition criteria” OR “nutrient profile” OR “nutrient profiling” OR “nutrition score” OR “nutrient score” OR “sugary drinks” OR keyhole) OR AB (“Healthy food” OR “Unhealthy food” OR “Discretionary food” OR “Occasional food” OR “Sometimes food” OR “Ultra-processed food” OR “ultra processed food” OR “NOVA” OR “Prepared food” OR “Highly processed food” OR “Processed food” OR “Food prepared outside the home” OR “Extra food” OR “Junk food” OR “Energy dense nutrient poor food” OR “Empty calorie food” OR “Non-core food” OR “Sugar sweetened beverage” OR “Beverage guidance system” OR “Core food” OR “Five food group” OR “Classification of foods and drinks” OR “nutritional criteria” OR “nutrition criteria” OR “nutrient profile” OR “nutrient profiling” OR “nutrition score” OR “nutrient score” OR “sugary drinks” OR keyhole)

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ERIC

S20	S18 AND S19
S19	ab(review) OR ti(review)Limits applied
S18	S14 NOT S15Limits applied
S17	S14 NOT S15Limits applied
S16	S14 NOT S15
S15	ab(zinc OR iron OR calcium OR vitamin OR micronutrient) OR ti(zinc OR iron OR calcium OR vitamin OR micronutrient)Limits applied
S14	S12 NOT S13
S13	ab(smoking or tobacco) OR ti(smoking or tobacco)Limits applied
S12	S10 NOT S11
S11	ab(clinical or laboratory) OR ti(clinical or laboratory)Limits applied
S10	S5 AND S8 AND S9
S9	ab(Austria OR Austrian OR Belgium OR Belgian OR Canada OR Canadian OR Chile OR Chilean OR Czech Republic OR Czech OR Denmark OR Danish OR Estonia OR Estonian OR Finland OR Finnish OR France OR French OR Germany OR German OR Greece OR Greek OR Hungary OR Hungarian OR Iceland OR Icelandic OR Ireland OR Irish OR Israel OR Israeli OR Italy OR Italian OR Japan OR Japanese OR Korea OR Korean OR Luxembourg OR Luxembourgian OR Mexico OR Mexican OR Netherlands OR Dutch OR New Zealand OR New Zealander OR Norway OR Norwegian OR Poland OR Polish OR Portugal OR Portuguese OR Slovak Republic OR Slovak OR Slovenia OR Spain OR Spanish OR Sweden OR Swedish OR Switzerland OR Swiss OR Turkey OR Turkish OR United Kingdom OR UK OR English OR United States OR US OR American OR Brazil OR Brazilian OR South Africa OR South African OR French Polynesia OR Argentina OR Argentinian OR Singapore OR Ghana OR European OR Scandinavian OR South American OR South America OR Latin America OR 'developed country' OR 'developed countries') OR ti(Austria OR Austrian OR Belgium OR Belgian OR Canada OR Canadian OR Chile OR Chilean OR Czech Republic OR Czech OR Denmark OR Danish OR Estonia OR Estonian OR Finland OR Finnish OR France OR French OR Germany OR German OR Greece OR Greek OR Hungary OR Hungarian OR Iceland OR Icelandic OR Ireland OR Irish OR Israel OR Israeli OR Italy OR Italian OR Japan OR Japanese OR Korea OR Korean OR Luxembourg OR Luxembourgian OR Mexico OR Mexican OR Netherlands OR Dutch OR New Zealand OR New Zealander OR Norway OR Norwegian OR Poland OR Polish OR Portugal OR Portuguese OR Slovak Republic OR Slovak OR Slovenia OR Spain OR Spanish OR Sweden OR Swedish OR Switzerland OR Swiss OR Turkey OR Turkish OR United Kingdom OR UK OR English OR United States OR US OR American OR Brazil OR Brazilian OR South Africa OR South African OR French Polynesia OR Argentina OR Argentinian OR Singapore OR Ghana OR European OR Scandinavian OR South American OR South America OR Latin America OR 'developed country' OR 'developed countries')Limits applied
S8	S6 OR S7
S7	su(nutrition policy)Limits applied
S6	ab(policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim) OR ti(policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim)Limits applied
S5	S1 OR S2 OR S3
S3	snacksLimits applied
S2	su(fast foods)Limits applied
S1	ab("Healthy food" OR "Unhealthy food" OR "Discretionary food" OR "Occasional food" OR "Sometimes food" OR "Ultra-processed food" OR "ultra processed food" OR "NOVA" OR "Prepared food" OR "Highly processed food" OR "Processed food" OR "Food prepared outside the home" OR "Extra food" OR "Junk food" OR "Energy dense nutrient poor food" OR "Empty calorie food" OR "Non-core food" OR "Sugar sweetened beverage" OR "Beverage guidance system" OR "Core food" OR "Five food group" OR "Classification of foods and drinks" OR "nutritional criteria" OR "nutrition criteria" OR "nutrient profile" OR "nutrient profiling" OR "nutrition score" OR "nutrient score" OR "sugary drinks" OR keyhole) OR ti("Healthy food" OR "Unhealthy food" OR "Discretionary food" OR "Occasional food" OR "Sometimes food" OR "Ultra-processed food" OR "ultra processed food" OR "NOVA" OR "Prepared food" OR "Highly processed food" OR "Processed food" OR "Food prepared outside the home" OR "Extra food" OR "Junk food" OR "Energy dense nutrient poor food" OR "Empty calorie food" OR "Non-core food" OR "Sugar sweetened beverage" OR "Beverage guidance system" OR "Core food" OR "Five food group" OR "Classification of foods and drinks" OR "nutritional criteria" OR "nutrition criteria" OR "nutrient profile" OR "nutrient profiling" OR "nutrition score" OR "nutrient score" OR "sugary drinks" OR keyhole)Limits applied

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Appendix 1B Results of the Part A pilot search

The results of the pilot search, as reported to NHMRC in November 2018, are appended here.

Aims of PART A Pilot Search

The aims of this pilot search were to:

1. establish the scope of the peer-reviewed literature available in a selection of databases;
2. refine the search terms and index categories employed in the peer-reviewed database search;
3. conduct a pilot screening on a sub-set of citations (title and abstract only) to determine the duration of the activity and proportion of citations excluded for each criterion,
4. establish the scope of the website search and search capabilities within the selected pages, and
5. start the iterative process of defining the fields in the data extraction tables for both the peer-reviewed literature and webpages.

Methods of PART A Pilot Search

The pilot search was conducted by Dr Brianna Fjeldsoe, who sought expert advice from an experienced UQ librarian. The project team reviewed the proposed search strategy and provided input. Professor Lee and Dr Fjeldsoe discussed the findings from the pilot to inform the final search strategy. NHMRC reviewed the Draft Research Protocol and provided positive feedback. The NHMRC wanted to clarify that the search is not limited to those nations who are defining 'unhealthy' food as 'discretionary' and to ensure that some terms from Phase One were included in the search terms. This feedback was incorporated into the Final Research Protocol. The Final Research protocol was accepted by NHMRC on the 17th May 2019. This pilot search starts from the search strategy proposed in the Final Research Protocol and refines it through an iterative process, the adaptations or clarifications that have been made to the search strategy since the Final Research Protocol are summarised at the end of this report.

Peer-reviewed literature search strategy

Search terms and index categories were combined in searches conducted in the following databases of peer-reviewed literature: PubMed (including MEDLINE), CINAHL, Web of Science, Scopus and EMBASE. An iterative process of refining the search terms was used. Three main iterative cycles of searches were conducted across the databases. Table A1Bi shows the term and index categories used in each pilot search iteration.

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Table A1Bi: Search terms and index categories used in four iterative pilot searches

Cluster for healthy and unhealthy food and drinks		Cluster for nutrition policy actions		Limiting clinical applications		Cluster related to in-scope countries
Pilot Search Iteration 1						
food OR foods OR drink* OR beverage* OR nutrition* OR nutrient* OR *Food and beverages (index term)*	AND	policy OR policies OR OR label* OR rating OR fortification OR advertis* OR claim OR *Nutrition policy (index term)*	NOT	(clinical OR laboratory)		-
Pilot Search Iteration 2						
(healthy food OR unhealthy food) OR food OR foods OR drink* OR beverage* OR nutrition* OR nutrient* OR NOVA OR *Food and beverages (index term)*	AND	policy OR policies OR strateg* OR label* OR rating OR fortification OR advertis* OR claim OR *Nutrition policy (index term)*	NOT	(clinical OR laboratory) (smoking OR tobacco)		-
Pilot Search Iteration 3						
Healthy food OR Unhealthy food OR Discretionary food OR Occasional food OR Sometimes food OR 'Ultra-processed food' OR NOVA OR Prepared food OR 'Highly processed food' OR Processed food OR 'Food prepared outside the home' OR Extra food OR Junk food OR 'Energy dense nutrient poor food' OR Empty calorie food OR Non-core food OR Sugar sweetened beverage* OR Beverage guidance system OR Core food OR Five food group OR 'Classification of foods and drinks' OR nutritional criteria OR nutrition criteria OR nutrient profile OR nutrient profiling OR nutrient score OR nutri* score OR Sugary drinks OR keyhole OR *Fast food (index term) OR Snacks (index term)#*	AND	policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim OR *Nutrition policy (index term)*	NOT	***Search iteration 3a included these as well:*** (clinical OR laboratory) (smoking OR tobacco) (zinc OR iron OR calcium OR vitamin OR micronutrient)	AND	Austria OR Austrian OR Belgium OR Belgian OR Canada OR Canadian OR Chile OR Chilean OR Czech Republic OR Czech OR Denmark OR Danish OR Estonia OR Estonian OR Finland OR Finnish OR France OR French OR Germany OR German OR Greece OR Greek OR Hungary OR Hungarian OR Iceland OR Icelandic OR Ireland OR Irish OR Israel OR Israeli OR Italy OR Italian OR Japan OR Japanese OR Korea OR Korean OR Luxembourg OR Luxembourgian OR Mexico OR Mexican OR Netherlands OR Dutch OR New Zealand OR New Zealander OR Norway OR Norwegian OR Poland OR Polish OR Portugal OR Portuguese OR Slovak Republic OR Slovak OR Slovenia OR Spain OR Spanish OR Sweden OR Swedish OR Switzerland OR Swiss OR Turkey OR Turkish OR United Kingdom OR UK OR English OR United States OR US OR American OR Brazil OR Brazilian OR South Africa OR South African OR French Polynesia OR Argentina OR Argentinian OR Singapore OR Ghana OR European OR Scandinavian OR developed country OR developed countries

The research team acknowledges that these are not synonyms for healthy or unhealthy foods. Fast food and snacks are not necessarily 'unhealthy'. These index terms are being used to capture the literature, but the researchers will still be screening the results for papers that define 'healthy or 'unhealthy' food and drinks or their synonyms.

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Limiters applied to citations within each database, across all iterations:

- Publication date: Jan 2009 - 2019
- Publication type: review (not just systematic reviews)
- English language
- Abstract available
- Humans (not animals).

The resulting citations in Search Iterations 1-3 were screened using the following inclusion and exclusion criteria:

Inclusion criterion

- Any review with a primary aim to provide a definition, tool, strategy, criteria or guidance to distinguish 'healthy' and 'unhealthy' food and drinks or their synonyms

Exclusion criteria

- Any review with a primary aim to answer a clinical research question, such as the relationship between foods, food groups or dietary patterns and health, wellness or specific medical conditions, including obesity
- Any review with a primary aim to examine an agricultural or environmental sustainability research question
- Any review that does not define or differentiate between 'healthy' and 'unhealthy' food and drinks or their synonyms in the text of the review
- Any review that does not extract data from the original papers on how 'healthy' and 'unhealthy' food and drinks were differentiated in the original study
- Any review that does not originate from one of the in-scope countries
- Any article that is not a review
- Any article that reports on a review protocol only

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The citations resulting from Search Iteration 3 were screened again using a refined set of inclusion and exclusion criteria, this screening is referred to as Search Iteration 4 and applied the following criteria:

Inclusion criterion

- Any review with a primary aim to provide a definition that distinguishes 'healthy' and 'unhealthy' food and drinks or their synonyms; or applies a definition that distinguishes healthy and unhealthy foods as a tool, strategy, criteria or guidance to improve diet and/or health

Exclusion criteria

- Any review with a primary aim to answer a clinical research question
- Any review that addresses the relationship between single nutrients, foods, food groups or dietary patterns and health, wellness or specific medical conditions, including obesity
- Any review with a primary aim to examine a social, agricultural or environmental sustainability research question

- Any review that does not include at least one original paper from one of the in-scope countries
- Any article that is not a review
- Any article that reports on a review protocol only
- Any review that does not define or differentiate between 'healthy' and 'unhealthy' food and drinks or their synonyms in the text of the review.

Grey literature search strategy

The following websites were searched during the pilot search:

- International
  - Health-evidence.ca https://www.healthevidence.org/
  - International Union for Health Promotion and Education http://www.iuhpe.org
  - Health Technology and Assessment Programme http://www.ncchta.org
  - NICE guidelines http://www.nice.org.uk
  - World Health Organisation www.who.int

3.

- National health-centred websites of in-scope countries:
  - US Department of Health & Human Services https://www.hhs.gov/
  - French Ministry of Social Affairs and Health https://solidarites-sante.gouv.fr/

All websites that are not published in English (and did not have a built-in translation option) were translated using the Google 'translate' function. The following search terms were systematically entered into each website-specific search engine:

- Healthy food OR Unhealthy food OR Discretionary food OR Occasional food OR Sometimes food OR 'Ultra-processed food' OR NOVA OR Prepared food OR 'Highly processed food' OR Processed food OR 'Food prepared outside the home' OR Extra food OR Junk food OR 'Energy dense nutrient poor food' OR Empty calorie food OR Non-core food OR Sugar sweetened beverage OR Beverage guidance system OR Core food OR Five food group OR 'Classification of foods and drinks' OR nutritional criteria OR nutrition criteria OR nutrient profile OR nutrient profiling OR nutrient score OR nutrient score OR Sugary drinks OR keyhole

The first five pages of returns (when sorted by relevance) from each search term was scrutinised. If returns were not formatted as pages, then the first ten items were scrutinised. If the list of returns included a URL link to a different webpage or a different ministry/ agency, this was not searched. Only returns that were pages within the website being searched were scrutinised. The webpages were screened using the following inclusion and exclusion criteria:

Inclusion criterion:

- Any article or report with a primary aim that is to provide a definition that distinguishes 'healthy' and 'unhealthy' food and drinks or their synonyms; or applies a definition that distinguishes healthy and unhealthy foods as a tool, strategy, criteria or guidance to improve diet and/or health

Exclusion criteria:

- Any article or report that had already been captured in the peer-reviewed literature search

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- Any peer-reviewed journal article (as these were the focus in the previous database searches)
- Any article or report published before 2009
- Any article or report with a primary aim that is to investigate the relationship between foods, food groups or dietary patterns and health, wellness or specific medical conditions, including obesity
- Any article with a primary aim that is to describe trends in consumption patterns of foods and food groups, does not define or differentiate between 'healthy' and 'unhealthy' food and drinks or their synonyms
- Any article that deals primarily with the assessment of the 'healthiness' of diets and dietary patterns, rather than the composite foods and/or drinks, such as dietary indexes.

Results of PART A Pilot Search

Peer-reviewed literature search results

Table A1Bii shows the number of citations resulting from the searches in each database before and after the limiters were applied. The individual database searches and number of citations excluded within each limiter are shown in additional material A.

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Table A1Bii: Overview of citation numbers within each database for each search iteration

		Pilot Search Iteration 1	Pilot Search Iteration 2	Pilot Search Iteration 3
PubMed	All citations	53,259	96,602	1,693
	After limiters applied	459	925	103
Web of Science	All citations	-	1,727	25,586
	After limiters applied	-	1,502*	1,089
Scopus	All citations	-	594	199
	After limiters applied	-	596*	145*
EMBASE	All citations	72,014	149,074	2,174
	After limiters applied	593	1,174	106
CINAHL	All citations	20,455	27,974	1,489
	After limiters applied	384	685	90
TOTAL exported citations		1,436	4,882	1,533

***** Limited to systematic reviews using term in title or abstract (limiter not available)

Pilot Search Iteration 3a was conducted to look at the impact of sequentially adding in 'NOT' phrases deemed necessary after conducting Search Iteration 3. Within the PubMed and Scopus databases the following 'NOT' terms shown below in Table A1Biii were added as Title/Abstract searches to the existing Iteration 3 searches.

Table A1Biii: Citation numbers from Search Iteration 3a, where 'NOT' terms were added

	PubMed	Scopus
Search Iteration 3 (with no 'NOT' terms entered)	1,808*	207*

Including NOT (clinical OR laboratory)	1,685	179
Including NOT (smoking or tobacco)	1,619	171
Including NOT (zinc OR iron OR calcium OR vitamin* OR micronutrient)	1,549	157
After limiters applied	95	91

* slightly larger than the citation counts shown in Table 2 for Search Iteration 3 because this search was conducted five days later

Peer-reviewed literature screening results

All citations were imported into EndNote X9, where duplicates were removed and Australian origin papers were identified* and removed (see Table A1Biv). A random sub-sample of 10% of citations from Pilot Search Iteration 1 (n=94) and Pilot Search Iteration 3 (n=134) were screened based on title and abstract using the exclusion criteria listed in Table A1Bv.

Table A1Biv: Number of citations resulting from searches after removing duplicates and Australian origin

Imported references	Pilot Search Iteration 1	Pilot Search Iteration 2	Pilot Search Iteration 3
TOTAL IMPORTED	**1,436**	**4,882**	**1,533**
Duplicates	371	1,820	180
Australian origin of publication	122	401	9*
TOTAL TO BE SCREENED	**943**	**2,661**	**1,344**

* Only screened based on 'Australia/n' in title (NOT author address), a further 129 would have been discarded based on Author Address - but the reviews were international in scope

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Table A1Bv: Peer-reviewed literature exclusion criteria and number (%) of citations in sub-sample

	Iteration 1 Screened on abstract & title	Iteration 1 Screened on full text	Notes	Iteration 3 Screened on abstract & title	Iteration 3 Screened on full text	Notes
TOTAL screened	94	16		134	25	
Exclusion reasons:						
Any review with a primary aim to answer a clinical research question, such as the relationship between foods, food groups or dietary patterns and health, wellness or specific medical conditions, including obesity	48 (51%)	1	Most of these were clear cut and judged from the title only	53 (40%)	0 (0%)	Most of these were clear cut and judged from the title only
Any review with a primary aim to examine an agricultural or environmental sustainability research question	-	-	Did not use this in first iteration	25 (19%)	0 (0%)	This sub-set of papers emegered in Iteration 3
Any review that does not define or differentiate between 'healthy' and 'unhealthy' food and drinks or their synonyms	30 (32%)	5	Most of these were judged on the abstract	27 (20%)	17 (66%)	Most of these were judged on the abstract
Any review that does not extract data from the original papers on how 'healthy' and 'unhealthy' food were differentiated	0 (0%)	9		-	-	After Iteration 1 this criterion was not applied
Any review that does not originate from one of the in-scope countries	0 (0%)	0		0 (0%)	0 (0%)	
Not a review	-	-		2 (1%)	3 (13%)	
Review protocol only	-	-		2 (1%)	0	
Still included after title and abstract screening	16 (17%)	-	See additional material C	25 (19%)	-	See additional material D
Still included after full text screening	-	1 (6%)	See additional material C	-	5 (21%)	See additional material D

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Table A1Bvi: Peer-reviewed literature exclusion criteria and number (%) of citations in Search Iteration 4 using refined exclusion criteria

	Iteration 4 Screened on abstract & title	**Iteration 4 Screened on full text**
TOTAL screened	134	24
Exclusion reasons:		
Any review with a primary aim to answer a clinical research question	42 (31%)	0
Any review that addresses the relationship between single nutrients, foods, food groups or dietary patterns and health, wellness or specific medical conditions, including obesity	11 (8%)	0
Any review with a primary aim to examine a social, agricultural or environmental sustainability research question	24 (18%)	0
Any review that does not include at least one original paper from one of the in-scope countries	0	0
Any article that is not a review	2 (1%)	1 (4%)
Any article that reports on a review protocol only	2 (1%)	0
Any review that does not define or differentiate between 'healthy' and 'unhealthy' food and drinks or their synonyms in the text of the review	39 (29%)	17 (71%)
Still included after title and abstract screening	24 (18%)	-
Still included after full text screening	-	6 (25%)

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Timing of sub-sample search tasks and estimations for full searches

Search Iteration 1

- The title and abstract screening for the subsample of 94 citations took approximately 45minutes. If the assumed number of citations for screening is 943 then the time to screen all citations based on title and abstract only would be approximately **8hours**.
- The full text screening for the subsample of 16 citations took approximately 90 minutes. If the same proportion of papers required full text screening (i.e. 17%) and the total citations requiring screening was 943, then approximately 160 papers will need to be screened based on full text. This would equate to **15 hours** of full text screening.
- Of the 16 citations, only one (6%) met the inclusion and exclusion criteria. Based on this proportion, if 160 were screened based on full text, then approximately **10 citations** would have been included.

Search Iteration 3

- The title and abstract screening for the subsample of 134 citations took approximately 45minutes. If the assumed number of citations for screening is 1,344 then the time to screen all citations based on title and abstract only would be approximately **8 hours**.
- The full text screening for the subsample of 25 citations took approximately 90 minutes. If the same proportion of papers required full text screening (i.e. 19%) and the total citations requiring screening was 1,344, then approximately 256 papers will need to be screened based on full text. This would equate to **16 hours** of full text screening.
- Of the 25 citations, five (21%) met the inclusion and exclusion criteria. Based on this proportion, if 256 were screened based on full text, then approximately **54 citations** would have been included.

Search Iteration 4 (based on citations from Search Iteration3, but using refined exclusion criteria)

- The title and abstract screening for the subsample of 134 citations took approximately 45minutes. If the assumed number of citations for screening is 1,344 then the time to screen all citations based on title and abstract only would be approximately **8hours**.

- The full text screening for the subsample of 24 citations took approximately 80 minutes. If the same proportion of papers required full text screening (i.e. 18%) and the total citations requiring screening was 1,344, then approximately 242 papers will need to be screened based on full text. This would equate to **14 hours** of full text screening.
- Of the 24 citations, six (25%) met the inclusion and exclusion criteria. Based on this proportion, if 242 were screened based on full text, then approximately **61 citations** would have been included.

Data extraction for peer-reviewed database searches

This pilot was intended to start the process of defining the extraction fields, which will be refined further during the initial data extraction process in consultation with the research team and NHMRC. The pilot peer-reviewed literature extraction table included the following fields:

- Country of First Author, Year, First Author, Authors, Title, Type of review, Aim of review, Term (healthy), Definition of Term (healthy), Source for definition (healthy), Intent or Application of definition (healthy), Term (unhealthy), Definition of term (unhealthy), Intent of application (unhealthy), Key conclusions of review, Study Inclusion/exclusion criteria, Type of Search Conducted, Number of papers/policies reviewed, Evaluation of application discussed?; Other evaluation notes, Was term definition extracted from original papers? Describe the data that is extracted in the review's summary table for original papers

Peer-reviewed literature search results

TableA1Bvii shows the number of returns from each website search and the number of pages that were deemed eligible for inclusion.

Table A1Bvii: Results of Pilot search of selected websites

Website	Search applied within website	Search Results	Included pages after screening
International sites			
Health-evidence.ca www.healthevidence.org	Cluster of terms for healthy and unhealthy foods AND cluster of terms for nutrition policy actions Limited to 2009-2019	503 journal articles	**0**
International Union for Health Promotion and Education http://www.iuhpe.org	Cluster of terms for healthy and unhealthy foods- entered separately		
	NOVA	29 returns	0
	All other terms	0 returns	0
Health Technology and Assessment Programme via the National Institute for Health Research https://www.journalslibrary.nihr.ac.uk/	Cluster of terms for healthy and unhealthy foods Limited to 2009-2019	707 journal articles	0
NICE guidelines http://www.nice.org.uk (NICE guidelines; Public Health guidelines)	Cluster of terms for healthy and unhealthy foods- entered separately		
	Healthy foods	3 returns	3
	Unhealthy foods	1 return	1
	Discretionary food	1 return	0
	Processed food	1 return	1
	Sometimes food	1 return	0
	NOVA	1 return	1
	Extra food	1 return	0
	Junk food	1 return	1
	All other terms	0 returns	0
World Health Organisation www.who.int (within Topic: "Nutrition")	Cluster of terms for healthy and unhealthy foods- entered separately		

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	Healthy food	408 returns	Not screened
	Unhealthy food	85 returns	Not screened
	Discretionary food	1 return	Not screened
	Occasional food	1 return	Not screened
	Sometimes food	3 returns	Not screened
	Ultra-processed food	144 returns	Not screened
	Highly processed food	7 returns	Not screened
	NOVA	355 returns[#]	Not screened
	Prepared food	45 returns	Not screened
	Extra food	6 returns	Not screened
	Junk food	63 returns	Not screened
	Sugar sweetened beverage	24 returns	Not screened
	Nutrient profile	66 returns	Not screened
	All other terms	0 returns	
National Sites			
US Department of Health and Human Services	Cluster of terms for healthy and unhealthy foods- entered separately	0 returns	0
	Using menu to navigate to an A-Z index identified: 'Dietary guidelines for Americans' [linked to Office of Disease Prevention and Health Promotion] and 'Nutrition' [led to link to US Food and Drugs Administration]		
French Ministry of Social Affairs and Health	Cluster of terms for healthy and unhealthy foods- entered separately		
	Healthy food	12 returns	1
	Nutri score	2 returns	1
	Nutrient profile	1 return	1
	All other terms	0 returns	0

these returns were not referring the dietary-related term NOVA but rather to geographical locations with the term Nova included (e.g. Nova Scotia)

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Data extraction for website searches

This pilot was intended to start the process of defining the extraction fields, which will be refined further during the initial data extraction process in consultation with the research team and NHMRC.

The pilot fields for data extraction from webpages included: Name of organisation; Website URL; Date of last website update; Date searched; Country; Sector; Webpage purpose/type; Title of page/URL; URL of page; Date of last update; Terms; Definition of Terms; Stated source of primary definition; Food list; Intent of use/ application of definition; Author commentary/opinions about term definition; Nutrient Criteria; Other notes.

Summary of findings from the PART A Pilot Search

This pilot search was invaluable for refining the search strategy to be adopted in the rapid review. Below we summarise the adaptations that were made as a result of the findings of the pilot search and how these differ from the search strategy included in the Final Research Protocol.

Search terms & index categories for peer-reviewed literature search

- Search Iteration 3 re-focused the cluster of terms for foods and drinks to be more specifically about 'healthy and unhealthy' terms rather than broadly being about food and drink (see Table A1Bi). This was necessary due to the large number of citations found in Search Iteration1 and 2 and due to the lack of specificity in the resulting papers. This cluster of terms is based on the list of terms used in the Phase One review as well as terms used in the international context (e.g. keyhole).
- Search Iteration 3a added the 'NOT' terms of (smoking or tobacco) and (zinc OR iron OR calcium OR vitamin OR micronutrient- see Table A1Bi). This step was taken to reduce the number of citations coming through which focused on smoking or tobacco policy or on a single nutrient. This will reduce the amount of title and abstract screening required.
- Search Iteration 3 included a cluster of terms referring to the in-scope countries as well as terms used to refer to multi-national unions of in-scope countries (e.g. 'European' see Table A1Bi). This adaptation was necessary to reduce the scope of citations being found, increase the specificity of the citations to be referring to in-scope countries and because the databases had very different capacities to limit citations by country of origin.

Inclusion & exclusion criteria for peer-reviewed literature search

- The wording of the inclusion criterion has been clarified to ensure that as well as including reviews that had a primary aim to define healthy/unhealthy foods and drinks, we were also interested in reviews that applied a definition. The intent of the criterion has not changed - just the wording.
- Separated out the exclusion criteria of focusing on a clinical research question from the description of epidemiological studies exploring relationships between foods and health
- Clarified that studies examining single nutrients (e.g. zinc) were excluded, with the exception of sodium, which is often used when describing unhealthy foods
- Clarified that reviews would be excluded if they had a primary aim to examine a social, agricultural or environmental sustainability research question. It was necessary to create this exclusion criteria based on the high proportion of literature in this field.
- Removed the following exclusion criteria: "Any review that does not extract data from the original papers on how 'healthy' and 'unhealthy' food and drinks were differentiated in the original study". This was necessary because the results from Search Iteration 1 demonstrated that very few reviews were extracting data on definitions applied in the original papers. We felt this would have narrowed the literature too much and skewed it towards reviews examining sugar-sweetened beverages, which appeared more likely to report definitions from the original papers.
- Clarify that we required only one original paper in a review to be from one of our in-scope countries, rather than needing the review to originate from an in-scope country. Most reviews take an international focus, so it did not make sense to exclude papers if they originated from out-of-scope countries but included papers from in-scope countries.

Inclusion & exclusion criteria for grey literature search

- The wording of the inclusion criterion has been clarified to ensure that as well as including reports or articles that had a primary aim to define healthy/unhealthy foods and drinks, we were also interested in articles that applied a definition. The intent of the criterion has not changed - just the wording.

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- An additional exclusion criterion was added to exclude peer-reviewed journal articles located during the website searches. These were the focus of the database searches and we did not want to replicate search findings.

Appendix 1B additional material A: Search outcomes for each search iteration in each databse, before and after applying limiters

PubMed Pilot search - Iteration 1

	Resulting publications
Search ((((((food[tiab] OR foods[tiab] OR drink*[tiab] OR beverage*[tiab] OR nutrition[tiab] OR nutrient*))) OR ((food and beverages[MeSH Terms])))) AND ((policy[Title/Abstract] OR policies[Title/Abstract] OR label*[Title/Abstract] OR rating[Title/Abstract] OR fortification[Title/Abstract] OR advertis*[Title/Abstract] OR claim[Title/Abstract]))) OR nutrition policy[MeSH Terms]) NOT (clinical[Title/Abstract] OR laboratory[Title/Abstract])	53,259
Limit to systematic reviews	616
Limit to Jan 2009 - 2019	554
Limit to humans	471
Limit to abstract available	468
Limit to English language	459
Final exported search	**459**

PubMed Pilot Search - Iteration 2

	Resulting publications
Search ((((((("Food and Beverages"[Mesh])) OR (((NOVA[Title/Abstract]) OR ((((((food[Title/Abstract]) OR foods[Title/Abstract]) OR drink*[Title/Abstract]) OR beverage*[Title/Abstract]) OR nutrition*[Title/Abstract]) OR nutrient*[Title/Abstract]))) OR ((healthy food[Title/Abstract]) OR unhealthy food[Title/Abstract])))) AND (("Nutrition Policy"[Mesh]) OR ((policy[Title/Abstract] OR policies[Title/Abstract] OR strateg*[Title/Abstract] OR label*[Title/Abstract] OR rating[Title/Abstract] OR fortification[Title/Abstract] OR advertis*[Title/Abstract] OR claim[Title/Abstract])))) NOT ((clinical[Title/Abstract]) OR laboratory[Title/Abstract])) NOT ((smoking[Title/Abstract]) OR tobacco[Title/Abstract])	96,602
Limit to systematic reviews	1,464
Limit to Jan 2009 - 2019	1,139
Limit to humans	952
Limit to abstract available	950
Limit to English language	925
Final exported search	**925**

PubMed Pilot Search- Iteration 3

	Resulting publications
Search ((Healthy food[Title/Abstract] OR Unhealthy food[Title/Abstract] OR Discretionary food[Title/Abstract] OR Occasional food[Title/Abstract] OR Sometimes food[Title/Abstract] OR Ultra-processed food[Title/Abstract] OR NOVA[Title/Abstract] OR Processed food[Title/Abstract] OR Prepared food[Title/Abstract] OR 'Highly processed food'[Title/Abstract] OR 'Food prepared outside the home'[Title/Abstract] OR Extra food[Title/Abstract] OR Junk food[Title/Abstract] OR 'Energy dense	1,693

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nutrient poor food'[Title/Abstract] OR 'Empty calorie food'[Title/Abstract] OR Non-core food[Title/Abstract] OR Sugar sweetened beverages[Title/Abstract] OR 'Beverage guidance systems'[Title/Abstract] OR Core foods[Title/Abstract] OR Five food group[Title/Abstract] OR 'Classification of foods and drinks'[Title/Abstract] OR nutritional criteria[Title/Abstract] OR nutrition criteria[Title/Abstract] OR nutrient profile [Title/Abstract] OR nutrient profiling[Title/Abstract] OR nutrient score[Title/Abstract] OR nutrition score[Title/Abstract] OR Sugary drinks[Title/Abstract] OR keyhole[Title/Abstract])))) OR fast food[MeSH Terms]) OR snacks[MeSH Terms])) AND (((((policy[Title/Abstract] OR policies[Title/Abstract] OR strategy[Title/Abstract] OR strategies[Title/Abstract] OR label[Title/Abstract] OR labelling[Title/Abstract] OR labeling[Title/Abstract] OR rating[Title/Abstract] OR fortification[Title/Abstract] OR advertising[Title/Abstract] OR advertise[Title/Abstract] OR claim[Title/Abstract])))) OR nutrition policy[MeSH Terms])) AND ((Austria[Title/Abstract] OR Austrian[Title/Abstract] OR Belgium[Title/Abstract] OR Belgian[Title/Abstract] OR Canada[Title/Abstract] OR Canadian[Title/Abstract] OR Chile[Title/Abstract] OR Chilean[Title/Abstract] OR Czech Republic[Title/Abstract] OR Czech[Title/Abstract] OR Denmark[Title/Abstract] OR Danish[Title/Abstract] OR Estonia[Title/Abstract] OR Estonian[Title/Abstract] OR Finland[Title/Abstract] OR Finnish[Title/Abstract] OR France[Title/Abstract] OR French[Title/Abstract] OR Germany[Title/Abstract] OR German[Title/Abstract] OR Greece[Title/Abstract] OR Greek[Title/Abstract] OR Hungary[Title/Abstract] OR Hungarian[Title/Abstract] OR Iceland[Title/Abstract] OR Icelandic[Title/Abstract] OR Ireland[Title/Abstract] OR Irish[Title/Abstract] OR Israel[Title/Abstract] OR Israeli[Title/Abstract] OR Italy[Title/Abstract] OR Italian[Title/Abstract] OR Japan[Title/Abstract] OR Japanese[Title/Abstract] OR Korea[Title/Abstract] OR Korean[Title/Abstract] OR Luxembourg[Title/Abstract] OR Luxembourgian[Title/Abstract] OR Mexico[Title/Abstract] OR Mexican[Title/Abstract] OR Netherlands[Title/Abstract] OR Dutch[Title/Abstract] OR New Zealand[Title/Abstract] OR New Zealander[Title/Abstract] OR Norway[Title/Abstract] OR Norwegian[Title/Abstract] OR Poland[Title/Abstract] OR Polish[Title/Abstract] OR Portugal[Title/Abstract] OR Portuguese[Title/Abstract] OR Slovak Republic[Title/Abstract] OR Slovak[Title/Abstract] OR Slovenia[Title/Abstract] OR Spain[Title/Abstract] OR Spanish[Title/Abstract] OR Sweden[Title/Abstract] OR Swedish[Title/Abstract] OR Switzerland[Title/Abstract] OR Swiss[Title/Abstract] OR Turkey[Title/Abstract] OR Turkish[Title/Abstract] OR United Kingdom[Title/Abstract] OR UK[Title/Abstract] OR English[Title/Abstract] OR United States[Title/Abstract] OR US[Title/Abstract] OR American[Title/Abstract] OR Brazil[Title/Abstract] OR Brazilian[Title/Abstract] OR South Africa[Title/Abstract] OR South African[Title/Abstract] OR French Polynesia[Title/Abstract] OR Argentina[Title/Abstract] OR Argentinian[Title/Abstract] OR Singapore[Title/Abstract] OR Ghana[Title/Abstract] OR European[Title/Abstract] OR Scandinavian[Title/Abstract] OR developed countries[Title/Abstract])	
Limit to systematic reviews	184
Limit to Jan 2009 - 2019	140
Limit to humans	109
Limit to abstract available	109
Limit to English language	103
Final exported search	**103**

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Web of Science- Iteration 2

	Resulting publications
# 3 #2 AND #1 NOT TS=(smoking or tobacco) NOT TS=(clinical OR laboratory)	320,805
# 2 TS=(policy OR policies OR strateg* OR label* OR rating OR fortification OR advertis* OR claim)	
# 1 TS=(healthy food OR unhealthy food OR food OR foods OR drink* OR beverage* OR nutrition* OR nutrient* OR NOVA)	

NB: Web of Science Categories did not align with search purpose, only used terms

NB: 'Topic' used as search field, which searches title, abstract, author keywords, and Keywords Plus.

Limit to systematic reviews	22,146
Limit to Jan 2009 - 2019	15,376
Limit to humans *(not available)*	15,376
Limit to abstract available *(not available)*	15,376
Limit to English language	14,979
Final exported search	**14,979**

Web of Science- Iteration 2a (refining to systematic reviews through search terms)

		Resulting publications
# 3	#2 AND #1 AND TS='systematic review" NOT TS=(smoking or tobacco) NOT TS=(clinical OR laboratory)	1,727
# 2	TS=(policy OR policies OR strateg* OR label* OR rating OR fortification OR advertis* OR claim)	
# 1	TS=(healthy food OR unhealthy food OR food OR foods OR drink* OR beverage* OR nutrition* OR nutrient* OR NOVA)	
NB: Web of Science Categories did not align with search purpose, only used terms		
NB: 'Topic' used as search field, which searches title, abstract, author keywords, and Keywords Plus.		
Limit to systematic reviews (excluded letters, conference abstracts)		1,701
Limit to Jan 2009 - 2019		1,555
Limit to humans *(not available)*		1,555
Limit to abstract available *(not available)*		1,555
Limit to English language		1,502
Final exported search		**1,502**

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Web of Science- Iteration 3

			Resulting publications
# 4	25,586	#3 AND #2 AND #1	25,586
# 3	8,146,305	TS=(Austria OR Austrian OR Belgium OR Belgian OR Canada OR Canadian OR Chile OR Chilean OR Czech Republic OR Czech OR Denmark OR Danish OR Estonia OR Estonian OR Finland OR Finnish OR France OR French OR Germany OR German OR Greece OR Greek OR Hungary OR Hungarian OR Iceland OR Icelandic OR Ireland OR Irish OR Israel OR Israeli OR Italy OR Italian OR Japan OR Japanese OR Korea OR Korean OR Luxembourg OR Luxembourgian OR Mexico OR Mexican OR Netherlands OR Dutch OR New Zealand OR New Zealander OR Norway OR Norwegian OR Poland OR Polish OR Portugal OR Portuguese OR Slovak Republic OR Slovak OR Slovenia OR Spain OR Spanish OR Sweden OR Swedish OR Switzerland OR Swiss OR Turkey OR Turkish OR United Kingdom OR UK OR English OR United States OR US OR American OR Brazil OR Brazilian OR South Africa OR South African OR French Polynesia OR Argentina OR Argentinian OR Singapore OR Ghana OR European OR Scandinavian OR developed countries)	
# 2	7,877,474	TS=(policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim)	

# 1	288,265	TS=(Healthy food OR Unhealthy food OR Discretionary food OR Occasional food OR Sometimes food OR 'Ultra-processed food' OR NOVA OR Prepared food OR 'Highly processed food' OR Processed food OR 'Food prepared outside the home' OR Extra food OR Junk food OR 'Energy dense nutrient poor food' OR Empty calorie food OR Non-core food OR Sugar sweetened beverage* OR Beverage guidance system OR Core food OR Five food group OR 'Classification of foods and drinks' OR nutritional criteria OR nutrition criteria OR nutrient profile OR nutrient profiling OR nutrient score OR nutri* score OR Sugary drinks OR keyhole)

NB: Web of Science Categories did not align with search purpose, only used terms

NB: 'Topic' used as search field, which searches title, abstract, author keywords, and Keywords Plus.

Limit to 'reviews'	1,851
Limit to Jan 2009 - 2019	1,120
Limit to humans *(not available)*	1,120
Limit to abstract available *(not available)*	1,120
Limit to English language	1,089
Final exported search	**1,089**

Scopus- Iteration 1

	Resulting publications
((((TITLE-ABS(healthy AND food OR unhealthy AND food OR food OR foods OR drink* OR beverage* OR nutrition* OR nutrient* OR nova)) OR (INDEXTERMS ("Food"))) AND ((TITLE-ABS(policy OR policies OR strateg* OR label* OR rating OR fortification OR advertis* OR claim)) OR (INDEX TERMS ("Nutrition Policy")))) AND NOT (TITLE-ABS (smoking OR tobacco))) AND NOT (TITLE-ABS (clinical OR laboratory))	66,421
Limit to reviews (not able to select systematic reviews)	8,847
Limit to Jan 2009 - 2019	5,489
Limit to humans	4,185
Limit to abstract available	4,137
Limit to English language	3,973
Final exported search	**3,973**

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Scopus- Iteration 2 (added "systematic review" to TITLE-ABS search)

	Resulting publications
((((TITLE-ABS (healthy AND food OR unhealthy AND food OR food OR foods OR drink* OR beverage* OR nutrition* OR nutrient* OR nova)) OR (INDEXTERMS ("Food"))) AND ((TITLE-ABS (policy OR policies OR strateg* OR label* OR rating OR fortification OR advertis* OR claim)) OR (INDEX TERMS ("Nutrition Policy")))) AND (TITLE-ABS ("systematic review"))	594
AND NOT (TITLE-ABS (smoking OR tobacco))) AND NOT (TITLE-ABS (clinical OR laboratory))	
Limit to reviews (removed book chapters and conference abstracts)	574

Limit to Jan 2009 - 2019	516
Limit to humans	516
Limit to abstract available	514
Limit to English language	506
Final exported search	**506**

Scopus- Iteration 3

	Resulting publications
(TITLE- ABS (austria OR austrian OR belgium OR belgian OR canada OR canadian OR chile OR chilean OR "Czech Republic" OR czech OR denmark OR danish OR estonia OR estonian OR finland OR finnish OR france OR fr ench OR germany OR german OR greece OR greek OR hungary OR hungarian OR iceland OR icelandic OR ireland OR irish OR israel OR israeli OR italy OR italian OR japan OR japanese OR korea OR korean OR lu xembourg OR luxembourgian OR mexico OR mexican OR netherlands OR dutch OR "New Zealand" OR "New Zealander" OR norway OR norwegian OR poland OR polish OR portugal OR portuguese OR "Slovak Republic" OR slovak OR slovenia OR spain OR spanish OR sweden OR swedish OR switzerland OR swiss O R turkey OR turkish OR "United Kingdom" OR uk OR english OR "United States" OR us OR american OR brazil OR brazilian OR "South Africa" OR "South African" OR "French Polynesia" OR argentina OR argentinian OR singapore OR ghana OR european OR scandinavian OR "develop ed countries")) AND ((TITLE- ABS (policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortificati on OR advertising OR advertise OR claim)) OR (INDEXTERMS (nutrition AND policy))) AND ((TITLE- ABS ("Healthy food" OR "Unhealthy food" OR "Discretionary food" OR "Occasional food" OR "Sometimes food" OR "Ultra-processed food" OR nova OR "Prepared food" OR "Highly processed food" OR "Processed food" OR "Food prepared outside the home" OR "Extra food" OR "Junk food" OR "Energy dense nutrient poor food" OR "Empty calorie food" OR "Non-core food" OR "Sugar sweetened beverage*" OR "Beverage guidance system" OR "Core food" OR "Five food group" OR "Classification of foods and drinks" OR "nutritional criteria" OR "nutrition criteria" OR "nutrient profile" OR "nutrient profiling" OR "nutrient score" OR "nutri* score" OR "Sugary drinks" OR keyhole)) OR (INDEXTERMS (fast AND foods)) OR (INDEXTERMS (snacks))) AND (TITLE/ABSTRACT(review))	199
Limit to reviews (removed book chapters and conference abstracts)	199
Limit to Jan 2009 - 2019	165
Limit to humans	161
Limit to abstract available	161
Limit to English language	145
Final exported search	**145**

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EMBASE – Iteration 1

	Resulting publications
Search ((((((food[tiab] OR foods[tiab] OR drink*[tiab] OR beverage*[tiab] OR nutrition[tiab] OR nutrient*))) OR ((food [EmTree Terms]))) AND ((policy[Title/Abstract] OR policies[Title/Abstract] OR label*[Title/Abstract] OR rating[Title/Abstract] OR fortification[Title/Abstract] OR advertis*[Title/Abstract] OR claim[Title/Abstract]))) OR nutrition policy[EmTree Terms]) *NB: no option to use a NOT phrase in EMBASE*	72,014
Limit to systematic reviews	972
Limit to Jan 2009 - 2019	877
Limit to humans	877

Limit to abstract available	598
Limit to English language	593
Final exported search	**593**

EMBASE – Iteration 2

	Resulting publications
healthy:ab,ti AND food:ab,ti OR unhealthy:ab,ti) AND food:ab,ti OR food:ab,ti OR foods:ab,ti OR drink*:ab,ti OR beverage*:ab,ti OR nutrition*:ab,ti OR nutrient*:ab,ti OR nova:ab,ti OR 'food'/de AND policy:ab,ti OR policies:ab,ti OR strateg*:ab,ti OR label*:ab,ti OR rating:ab,ti OR fortification:ab,ti OR advertis*:ab,ti OR claim:ab,ti OR 'nutrition policy'/exp *NB: no option to use a NOT phrase in EMBASE*	149,074
Limit to systematic reviews	1,935
Limit to Jan 2009 - 2019	1,725
Limit to humans	1,725
Limit to abstract available	1,263
Limit to English language	1,174
Final exported search	**1,174**

EMBASE – Iteration 3

		Resulting publications
#9	#4 AND #7 AND #8	2,174
#8	austria:ab,ti OR austrian:ab,ti OR belgium:ab,ti OR belgian:ab,ti OR canada:ab,ti OR canadian:ab,ti OR chile:ab,ti OR chilean:ab,ti OR 'czech republic':ab,ti OR czech:ab,ti OR denmark:ab,ti OR danish:ab,ti OR estonia:ab,ti OR estonian:ab,ti OR finland:ab,ti OR finnish:ab,ti OR france:ab,ti OR french:ab,ti OR germany:ab,ti OR german:ab,ti OR greece:ab,ti OR greek:ab,ti OR hungary:ab,ti OR hungarian:ab,ti OR iceland:ab,ti OR icelandic:ab,ti OR ireland:ab,ti OR irish:ab,ti OR israel:ab,ti OR israeli:ab,ti OR italy:ab,ti OR italian:ab,ti OR japan:ab,ti OR japanese:ab,ti OR korea:ab,ti OR korean:ab,ti OR luxembourg:ab,ti OR luxembourgian:ab,ti OR mexico:ab,ti OR mexican:ab,ti OR netherlands:ab,ti OR dutch:ab,ti OR 'new zealand':ab,ti OR 'new zealander':ab,ti OR norway:ab,ti OR norwegian:ab,ti OR poland:ab,ti OR polish:ab,ti OR portugal:ab,ti OR portuguese:ab,ti OR 'slovak republic':ab,ti OR slovak:ab,ti OR slovenia:ab,ti OR spain:ab,ti OR spanish:ab,ti OR sweden:ab,ti OR swedish:ab,ti OR switzerland:ab,ti OR swiss:ab,ti OR turkey:ab,ti OR turkish:ab,ti OR 'united kingdom':ab,ti OR uk:ab,ti OR english:ab,ti OR 'united states':ab,ti OR us:ab,ti OR american:ab,ti OR brazil:ab,ti OR brazilian:ab,ti OR 'south africa':ab,ti OR 'south african':ab,ti OR 'french polynesia':ab,ti OR argentina:ab,ti OR argentinian:ab,ti OR singapore:ab,ti OR ghana:ab,ti OR european:ab,ti OR scandinavian:ab,ti OR 'developed country':ab,ti	
#7	#5 OR #6	
#6	'nutrition policy'/exp policy:ab,ti OR policies:ab,ti OR strategy:ab,ti OR strategies:ab,ti OR label:ab,ti OR labelling:ab,ti OR labeling:ab,ti OR rating:ab,ti OR fortification:ab,ti OR advertising:ab,ti OR advertise:ab,ti OR claim:ab,ti	
#4	#1 OR #2 OR #3	
#3	'snacks'/exp	
#2	'fast foods'/exp 'healthy food':ab,ti OR 'unhealthy food':ab,ti OR 'discretionary food':ab,ti OR 'occasional food':ab,ti OR 'sometimes food':ab,ti OR 'ultra-processed food':ab,ti OR nova:ab,ti OR 'prepared food':ab,ti OR 'highly processed food':ab,ti OR 'processed food':ab,ti OR 'food prepared outside the home':ab,ti OR 'extra food':ab,ti OR 'junk food':ab,ti OR 'energy dense nutrient poor food':ab,ti OR 'empty calorie food':ab,ti OR 'non-core food':ab,ti OR 'sugar sweetened beverage*':ab,ti OR	
#1	'beverage guidance system':ab,ti OR 'core food':ab,ti OR 'five food group':ab,ti OR 'classification	

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of foods drinks':ab,ti OR 'nutritional criteria':ab,ti OR 'nutrition criteria':ab,ti OR 'nutrient profile':ab,ti OR 'nutrient profiling':ab,ti OR 'nutrient score':ab,ti OR 'nutri* score':ab,ti OR 'sugary drinks':ab,ti OR keyhole:ab,ti	
Limit to systematic reviews	147
Limit to Jan 2009 - 2019	108
Limit to humans	108
Limit to abstract available	108
Limit to English language	106
Final exported search	**106**

CINAHL – Iteration 1

	Resulting publications
Search ((((((food[tiab] OR foods[tiab] OR drink*[tiab] OR beverage*[tiab] OR nutrition[tiab] OR nutrient*))) OR ((food [Subject]))) AND ((policy[Title/Abstract] OR policies[Title/Abstract] OR label*[Title/Abstract] OR rating[Title/Abstract] OR fortification[Title/Abstract] OR advertis*[Title/Abstract] OR claim[Title/Abstract])) OR nutrition policy[Subject])	20,455
NB: no option to use a NOT phrase in CINAHL	
Limit to systematic reviews	494
Limit to Jan 2009 - 2019	424
Limit to humans	400
Limit to abstract available	384
Limit to English language	384
Final exported search	**384**

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CINAHL – Iteration 2

	Resulting publications
Search (healthy:ab,ti AND food:ab,ti OR unhealthy:ab,ti) AND food:ab,ti OR food:ab,ti OR foods:ab,ti OR drink*:ab,ti OR beverage*:ab,ti OR nutrition*:ab,ti OR nutrient*:ab,ti OR nova:ab,ti) OR ((food [Subject]))) AND ((policy[Title/Abstract] OR policies[Title/Abstract] OR strateg*[Title/Abstract] OR label*[Title/Abstract] OR rating[Title/Abstract] OR fortification[Title/Abstract] OR advertis*[Title/Abstract] OR claim[Title/Abstract]))) OR nutrition policy[Subject])	27,974
NB: no option to use a NOT phrase in CINAHL	
Limit to systematic reviews	904
Limit to Jan 2009 - 2019	777
Limit to humans	723
Limit to abstract available	705
Limit to English language	685
Final exported search	**685**

CINAHL – Iteration 3

		Resulting publications
S9	S4 AND S7 AND S8	1,489
S8	TI (Austria OR Austrian OR Belgium OR Belgian OR Canada OR Canadian OR Chile OR Chilean OR Czech Republic OR Czech OR Denmark OR Danish OR Estonia OR Estonian OR Finland OR Finnish OR France OR French OR Germany OR German OR Greece OR Greek OR Hungary OR Hungarian OR Iceland OR Icelandic OR Ireland OR Irish OR Israel OR Israeli OR Italy OR Italian OR Japan OR Japanese OR Korea OR Korean OR	

	Luxembourg OR Luxembourgian OR Mexico OR Mexican OR Netherlands OR Dutch OR New Zealand OR New Zealander O ...	
S7	S5 OR S6	
S6	SU nutrition policy	
S5	TI (policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim) OR AB (policy OR policies OR strategy OR strategies OR label OR labelling OR labeling OR rating OR fortification OR advertising OR advertise OR claim)	
S4	S1 OR S2 OR S3	
S3	SU snacks	
S2	SU fast foods	
S1	TI (Healthy food OR Unhealthy food OR Discretionary food OR Occasional food OR Sometimes food OR 'Ultra-processed food' OR NOVA OR Prepared food OR 'Highly processed food' OR Processed food OR 'Food prepared outside the home' OR Extra food OR Junk food OR 'Energy dense nutrient poor food' OR Empty calorie food OR Non-core food OR Sugar sweetened beverage* OR Beverage guidance system OR Core food OR Five food group OR 'Classification of foods and drinks' OR nutritional criteria OR nutrition crit....	
Limit to systematic reviews		117
Limit to Jan 2009 - 2019		93
Limit to humans		93
Limit to abstract available		93
Limit to English language		90
Final exported search		**90**

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Appendix 1B additional material B: the impact of adding 'strateg*' to search terms capturing Nutrition Policy Actions

PubMed search

Search ("Nutrition Policy"[Mesh]) OR ((policy[Title/Abstract] OR policies[Title/Abstract] OR strateg*[Title/Abstract] OR label*[Title/Abstract] OR rating[Title/Abstract] OR fortification[Title/Abstract] OR advertis*[Title/Abstract] OR claim[Title/Abstract]))	178,6220
Search ((("Nutrition Policy"[Mesh]) OR ((policy[Title/Abstract] OR policies[Title/Abstract] OR label*[Title/Abstract] OR rating[Title/Abstract] OR fortification[Title/Abstract] OR advertis*[Title/Abstract] OR claim[Title/Abstract]))))	87,3824

Interpretation of strateg* in PubMed:
(strateg[Title/Abstract] OR strategе[Title/Abstract] OR strategeies[Title/Abstract] OR strategeis[Title/Abstract] OR strategem[Title/Abstract] OR strategems[Title/Abstract] OR strategene[Title/Abstract] OR strategenic[Title/Abstract] OR strategeri[Title/Abstract] OR strateges[Title/Abstract] OR strategi[Title/Abstract] OR strategia[Title/Abstract] OR strategiai[Title/Abstract] OR strategiak[Title/Abstract] OR strategic[Title/Abstract] OR strategic'[Title/Abstract] OR strategical[Title/Abstract] OR strategically[Title/Abstract] OR strategically'[Title/Abstract] OR strategicfactor[Title/Abstract] OR strategicfunds[Title/Abstract] OR strategicimplant[Title/Abstract] OR strategicly[Title/Abstract] OR strategicmedicine[Title/Abstract] OR strategico[Title/Abstract] OR strategicplan[Title/Abstract] OR strategicrole[Title/Abstract] OR strategics[Title/Abstract] OR strategicway[Title/Abstract] OR strategie[Title/Abstract] OR strategiebericht[Title/Abstract] OR strategieen[Title/Abstract] OR strategien[Title/Abstract] OR strategienzursicherungrationalerantibiotika[Title/Abstract] OR strategier[Title/Abstract] OR strategiers[Title/Abstract] OR strategies[Title/Abstract] OR strategies'[Title/Abstract] OR strategies12[Title/Abstract] OR strategiesand[Title/Abstract] OR strategieseducationself[Title/Abstract] OR strategiesfocusing[Title/Abstract] OR strategiesfor[Title/Abstract] OR strategiesfuture[Title/Abstract] OR strategiesin[Title/Abstract] OR strategiesincreased[Title/Abstract] OR strategiess[Title/Abstract] OR strategiesshould[Title/Abstract] OR strategiest[Title/Abstract] OR strategiesto[Title/Abstract] OR strategieswere[Title/Abstract] OR strategii[Title/Abstract] OR strateging[Title/Abstract] OR strategique[Title/Abstract] OR strategiques[Title/Abstract] OR strategires[Title/Abstract] OR strategis[Title/Abstract] OR strategisch[Title/Abstract] OR strategise[Title/Abstract] OR strategised[Title/Abstract] OR strategising[Title/Abstract] OR strategist[Title/Abstract] OR strategist'[Title/Abstract] OR strategist's[Title/Abstract] OR strategists[Title/Abstract] OR strategists'[Title/Abstract] OR strategiy[Title/Abstract] OR strategization[Title/Abstract] OR strategize[Title/Abstract] OR strategized[Title/Abstract] OR strategizes[Title/Abstract] OR strategizing[Title/Abstract] OR strategles[Title/Abstract] OR strategm[Title/Abstract] OR stratego[Title/Abstract] OR strategres[Title/Abstract] OR strategtes[Title/Abstract] OR strategus[Title/Abstract] OR strategy[Title/Abstract] OR strategy'[Title/Abstract] OR strategy''[Title/Abstract] OR strategy's[Title/Abstract] OR strategy2[Title/Abstract] OR strategyand[Title/Abstract] OR strategydecided[Title/Abstract] OR strategydirected[Title/Abstract] OR strategyefficiently[Title/Abstract] OR strategyemployed[Title/Abstract] OR strategyfor[Title/Abstract] OR strategyforimplementing[Title/Abstract] OR strategyies[Title/Abstract] OR strategyin[Title/Abstract] OR strategylaboratory[Title/Abstract] OR strategylargelydepends[Title/Abstract] OR strategylimited[Title/Abstract] OR strategyminimum[Title/Abstract] OR strategyremains[Title/Abstract] OR strategys[Title/Abstract] OR strategyst[Title/Abstract] OR strategythese[Title/Abstract])

Web of Science

TS=(policy OR policies OR strateg* OR label* OR rating OR fortification OR advertis* OR claim)	8,004,388
TS=(policy OR policies OR label* OR rating OR fortification OR advertis* OR claim)	6,277,590

Scopus

TITLE-ABS (policy OR policies OR strateg* OR label* OR rating OR fortification OR advertis* OR claim)	4,701,551
TITLE-ABS (policy OR policies OR label* OR rating OR fortification OR advertis* OR claim)	2,408,903

EMBASE

policy:ab,ti OR policies:ab,ti OR strateg*:ab,ti OR label*:ab,ti OR rating:ab,ti OR fortification:ab,ti OR advertis*:ab,ti OR claim:ab,ti	2,236,278
policy:ab,ti OR policies:ab,ti OR label*:ab,ti OR rating:ab,ti OR fortification:ab,ti OR advertis*:ab,ti OR claim:ab,ti	1,075,730

CINAHL

TI (policy OR policies OR strateg* OR label* OR rating OR fortification OR advertis* OR claim) OR AB (policy OR policies OR strateg* OR label* OR rating OR fortification OR advertis* OR claim)	434,562
TI (policy OR policies OR label* OR rating OR fortification OR advertis* OR claim) OR AB (policy OR policies OR label* OR rating OR fortification OR advertis* OR claim)	224,266

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Appendix 1B additional material C: Papers requiring full text screening in sub-sample of Pilot Search Iteration 1

The highlighted citation was included after full text review.

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Appendix 2A Table of detailed data extraction from peer-reviewed reviews

Provided as separate attachment for readability

Appendix 2B Table of detailed data extraction from international websites

Provided as separate attachment for readability

Appendix 2C Table of detailed data extraction from national websites

Provided as separate attachment for readability

Appendix 3A Table A3.1. Summary data extraction provided as supplementary table by Labonte et al (2018)

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Appendix 3B Table A3.2. Full details of data extraction by Labonte et al (2018) sent to research team

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Appendix 4A Reordered data extraction table for 'unhealthy' food and drinks in the peer reviewed reviews

Provided as separate attachment for readability

Appendix 4B Reordered data extraction table for 'unhealthy' food and drinks in the international websites

Provided as separate attachment for readability

Appendix 4C Reordered data extraction table for 'unhealthy' food and drinks in the national websites

Provided as separate attachment for readability

Appendix 5A Reordered data extraction table for ‘healthy’ food and drinks in the peer reviewed reviews

Provided as separate attachment for readability

Appendix 5B Reordered data extraction table for ‘healthy’ food and drinks in the international websites

Provided as separate attachment for readability

Appendix 5C Reordered data extraction table for ‘healthy’ food and drinks in the national websites

Provided as separate attachment for readability

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Appendix 6 The NOVA food classification system and its four groups defined according to the extent and purpose of food processing

Table 1 from the report *Ultra-processed foods, diet quality, and health using the NOVA classification system* by Carlos Augusto Monteiro and colleagues (2019).

NOVA group	Definition	Examples
|GROUP 1| Unprocessed or minimally processed foods	*Unprocessed* Edible parts of plants (fruit, seeds, leaves, stems, roots, tubers) or of or from animals (muscle, fat, offal, eggs, milk), and also fungi, algae, all after separation from nature. Spring and tap water. *Minimally processed* Unprocessed foods altered by industrial processes such as removal of inedible or unwanted parts, drying, powdering, squeezing, crushing, grinding, fractioning, steaming, poaching, boiling, roasting, and pasteurization, chilling, freezing, placing in containers, vacuum packaging, non-alcoholic fermentation, and other methods that do not add salt, sugar, oils or fats or other food substances to the original food. The main aim of these processes is to extend the life of unprocessed foods, enabling their storage for longer use, or to make them edible, and, often, to make their preparation easier or more diverse. Infrequently, minimally processed foods contain additives that prolong product duration, protect original properties or prevent proliferation of microorganisms.	Fresh, squeezed, chilled, frozen, or dried fruit and leafy and root vegetables; grains such as brown, parboiled or white rice, corn cob or kernel, wheat berry or grain; legumes such as beans, lentils, and chickpeas; starchy roots and tubers such as potatoes, sweet potatoes and cassava; fungi such as fresh or dried mushrooms; meat, poultry, fish and seafood, whole or in the form of steaks, fillets and other cuts; fresh, powdered, chilled or frozen eggs; fresh, powdered or pasteurized milk; fresh or pasteurized fruit or vegetable juices (with no added sugar, sweeteners or flavours); grits, flakes or flour made from corn, wheat, oats, or cassava; tree and ground nuts and other oily seeds (with no added salt or sugar); herbs and spices used in culinary preparations, such as thyme, oregano, mint, pepper, cloves and cinnamon, whole or powdered, fresh or dried; fresh or pasteurized plain yoghurt; tea, coffee, and drinking water. Also includes foods made up from two or more items in this group, such as dried mixed fruits, granola made from cereals, nuts and dried fruit with no added sugar, honey or oil; pasta, couscous and polenta made with flours, flakes or grits and water; and foods with vitamins and minerals added generally to replace nutrients lost during processing, such as wheat or corn flour fortified with iron and folic acid.
|GROUP 2| Processed culinary ingredients	Substances obtained directly from group 1 foods or from nature by industrial processes such as pressing, centrifuging, refining, extracting or mining. Used to prepare, season and cook group 1 foods. May contain additives that prolong product duration, protect original properties or prevent proliferation of microorganisms.	Vegetable oils crushed from seeds, nuts or fruit (notably olives); butter and lard obtained from milk and pork; sugar and molasses obtained from cane or beet; honey extracted from combs and syrup from maple trees; starches extracted from corn and other plants; vegetable oils with added anti-oxidants; salt mined or from seawater, and table salt with added drying agents. Also includes products consisting of group 2 items, such as salted butter, and group 2 items with added vitamins or minerals, such as iodised salt.
|GROUP 3| Processed foods	Products made by adding salt, oil, sugar or other group 2 ingredients to group 1 foods, using preservation methods such as canning and bottling, and, in the case of breads and cheeses, using nonalcoholic fermentation. Processes and ingredients here are designed to increase the durability of group 1 foods and make them more enjoyable by modifying or enhancing their sensory qualities. They may contain additives that prolong product duration, protect original properties, or prevent proliferation of microorganisms.	Canned or bottled vegetables and legumes in brine; salted or sugared nuts and seeds; salted, dried, cured, or smoked meats and fish; canned fish (with or without added preservatives); fruit in syrup (with or without added anti-oxidants); freshly made unpackaged breads and cheeses.
|GROUP 4|	Formulations of ingredients, mostly of exclusive industrial use, made by a series of industrial	Many ready-to-consume products such as carbonated soft drinks; sweet or savoury

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NOVA group	Definition	Examples
Ultra-processed foods	processes, many requiring sophisticated equipment and technology (hence 'ultra-processed'). Processes used to make ultra-processed foods include the fractioning of whole foods into substances, chemical modifications of these substances, assembly of unmodified and modified food substances using industrial techniques such as extrusion, moulding and pre-frying; use of additives at various stages of manufacture whose functions include making the final product palatable or hyper-palatable; and sophisticated packaging, usually with plastic and other synthetic materials. Ingredients include sugar, oils or fats, or salt, generally in combination, and substances that are sources of energy and nutrients that are of no or rare culinary use such as high fructose corn syrup, hydrogenated or interesterified oils, and protein isolates; classes of additives whose function is to make the final product palatable or more appealing such as flavours, flavour enhancers, colours, emulsifiers, and sweeteners, thickeners, and anti-foaming, bulking, carbonating, foaming, gelling, and glazing agents; and additives that prolong product duration, protect original properties or prevent proliferation of microorganisms. Processes and ingredients used to manufacture ultra-processed foods are designed to create highly profitable products (low-cost ingredients, long shelflife, emphatic branding), convenient (ready-to-consume) hyper-palatable products liable to displace freshly prepared dishes and meals made from all other NOVA food groups. Adapted from Monteiro *et al.,* 2017a	packaged snacks; chocolate, candies (confectionery); ice-cream; mass-produced packaged breads and buns; margarines and other spreads; cookies (biscuits), pastries, cakes, and cake mixes; breakfast 'cereals', 'cereal' and 'energy' bars; 'energy' drinks; milk drinks, 'fruit' yoghurts and 'fruit' drinks; 'cocoa' drinks; 'instant' sauces. Many pre-prepared ready-to-heat products including pies and pasta and pizza dishes; poultry and fish 'nuggets' and 'sticks', sausages, burgers, hot dogs, and other reconstituted meat products; and powdered and packaged 'instant' soups, noodles and desserts. Infant formulas, follow-on milks, other baby products; 'health' and 'slimming' products such as meal replacement shakes and powders.

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