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Abbreviations

BMI	body mass index
CI	confidence interval
cRCT	cluster randomized controlled trial
ERIC	Educational Resources Information Center
FAO	Food and Agriculture Organization of the United Nations
GIFNA	Global database on the Implementation of Food and Nutrition Action
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HDL-C	high-density lipoprotein cholesterol
HIC	high-income country
LDL-C	low-density lipoprotein cholesterol
LIC	lower-income country
LMIC	lower middle-income country
MD	mean difference
NA	not applicable
NCD	noncommunicable disease
NFSI	Nutrition-Friendly Schools Initiative
NUGAG	Nutrition Guidance Expert Advisory Group
OR	odds ratio
PICO	population, intervention, comparator and outcome
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
RCT	randomized controlled trial
RR	risk ratio
SES	socioeconomic status
TC	total cholesterol
TG	triglycerides
UMIC	upper middle-income country
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
WFP	World Food Programme
WHO	World Health Organization

Glossary

Children: Used in this guideline to refer to all children aged 2 years and older attending pre-, primary or secondary school.

Food: Food is usually understood to include food and non-alcoholic beverages. This guideline reflects the research it draws upon. In most contexts in this guideline, food refers to food and non-alcoholic beverages. In some contexts, however, it refers only to foods (excluding non-alcoholic beverages) or only to non-alcoholic beverages (e.g. where studies or standards separately address non-alcoholic beverages such as sugar-sweetened beverages). The meaning is clarified within each section of this guideline as necessary.

Food provision: Used in this guideline to describe direct food and beverage provision, including through school meal programmes, fruit and vegetable distribution, and milk provision.

Foods that contribute to a healthy diet: Nutrient-dense foods rich in naturally occurring fibre and/or unsaturated fatty acids, low in saturated fatty acids, *trans*-fatty acids, free sugars and salt, free of non-sugar sweeteners, and/or the consumption of which is associated with positive health outcomes.

Foods that do not contribute to a healthy diet: Foods high in saturated fatty acids, *trans*-fatty acids, free sugars and/or salt and/or which contain non-sugar sweeteners, and which are usually highly processed, and/or the consumption of which is associated with negative health outcomes.

Healthy diet: Healthy diets need to meet four core principles. They need to be:

- adequate and provide enough essential nutrients to prevent deficiencies and promote health, without excess;
- balanced in energy intake, and energy sources (fats, carbohydrates and proteins);
- moderate in consumption of foods, nutrients or other compounds associated with detrimental health effects; and
- diverse and include a wide variety of nutritious foods within and across food groups *(1)*.

Marketing: Any form of commercial communication, message or action that acts to advertise or otherwise promote a product or service, or its related brand, and is designed to increase, or has the effect of increasing, the recognition, appeal and/or consumption of products and services *(2)*.

Non-sugar sweeteners: All synthetic and naturally occurring or modified non-nutritive sweeteners that are not classified as sugars *(3)*. Sugar alcohols and low-calorie sugars are not considered to be non-sugar sweeteners *(3)*.

Nudging interventions: Interventions that deliberately adjust the choice architecture and the context within which people make decisions. A change to any aspect of the choice architecture that influences choice behaviour can be classified as a nudge, including how options are presented to people. Food choice architecture relates to the various ways food options are framed to promote or demote the selection of certain food options and the subsequent influence these have on the selections people make. Nudging should not be an alternative to systemic changes and long-term solutions or regulations *(4)*.

Nutrition standards or rules: Standards or rules that determine the quality and quantity of foods and/or beverages served or sold at schools.

Policies: Laws, regulations, rules and understandings that are adopted on a collective basis to guide individual and collective behaviour, including legislation and organizational policy.

School food environment: The foods provided, served, sold or consumed inside and around school premises, their quality (safety and healthfulness), and how they are marketed, labelled and priced.

Executive summary

Background

A healthy diet and good nutrition are fundamental for health and well-being throughout life. Unhealthy diets are a leading global public health risk, contributing to all forms of malnutrition including undernutrition; micronutrient deficiencies; and overweight, obesity and diet-related noncommunicable diseases (NCDs).

Schools play an important role in promoting healthy diets and good nutrition for children, contributing to the reduction of health and nutrition disparities. A strong evidence base supports the Nutrition-Friendly Schools Initiative (NFSI) developed by the World Health Organization (WHO) and partner agencies. The NFSI calls for school nutrition policies, awareness and capacity-building of the school community, nutrition and health–promoting curricula, supportive school nutrition and health services, and supportive school environments for good nutrition.

The interlinkages between health, nutrition and education have long been recognized and the importance of promoting public health in schools has been acknowledged for decades. Over the years, there have been numerous initiatives and calls to action to protect, promote and support a healthy diet and good nutrition within the school setting, such as FRESH (developed by the United Nations Educational, Scientific and Cultural Organization (UNESCO), WHO, United Nations Children's Fund (UNICEF) and the World Bank) and the School Meals Coalition (coordinated by the World Food Programme (WFP)). However, further progress is still needed.

Objective, scope and methods

In response to requests from Member States and to strengthen and streamline support for development and implementation of new or improved school food and nutrition policies and interventions, WHO began developing this guideline.

The objectives of this guideline are to:

- provide evidence-based recommendations and implementation considerations on school food and nutrition policies and interventions to improve school food environments;
- enable evidence-informed advocacy to advance action on school food and nutrition policies and interventions;
- guide future research to further strengthen the evidence base for action on school food and nutrition policies and interventions; and
- contribute to the creation of food environments that enable healthy dietary practices among children.

The scope of this guideline includes policies and interventions that influence the school food environment. In-scope interventions for which evidence-informed recommendations were made[1] included:

- food provision to students in schools;

[1] Two additional interventions were initially defined as in-scope: marketing restrictions on foods that do not contribute to a healthy diet in and around schools, and pricing policies to promote foods that contribute to a healthy diet in schools. However, the systematic review found no direct evidence for these two policies in school settings. The guideline development group therefore proposed referring to the WHO guideline on policies to protect children from the harmful impact of food marketing and the WHO guideline on fiscal policies to promote healthy diets. The implementation of these guidelines at the national level would impact school settings.

- nutrition standards or rules that determine the quality of food served or sold in and around schools; and
- nudging interventions promoting healthy food behaviours in the school environment.

The scope of this guideline was informed by a scoping review of the existing evidence on school food and nutrition policies interventions. The WHO Steering Committee and the guideline development group refined the scope to focus on interventions that affect the school food environment, one of the five components of the NFSI. Other resources provide guidance on additional relevant school-based interventions. These include the WHO guideline on school health services, which recommends nutrition services be provided in schools; the WHO standards for water, sanitation and hygiene in schools; and the WHO–UNESCO global standards for making every school a health-promoting school, which provide guidance for government efforts towards health-promoting education systems and schools, by emphasizing the importance of health-promoting schools as a system of governance. The recommendations in this guideline should also be considered together with other WHO dietary guidelines and guidelines on food environment policies, including the WHO guideline on policies to protect children from the harmful impact of food marketing.

This guideline was developed using the procedures outlined in the *WHO handbook for guideline development*. These procedures include a review of systematically gathered evidence by an international, multidisciplinary group of experts (the Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Policy Actions); assessment of the certainty of that evidence via Grading of Recommendations Assessment, Development and Evaluation (GRADE); and consideration of additional decision criteria potentially relevant for the translation of the identified evidence into recommendations.

The evidence

A systematic review (with a search conducted in April–May 2020) and a subsequent rapid review update (covering the literature to October 2023) assessed the effects of in-scope interventions that influence the school food environment. The in-scope interventions were direct food provision to students in schools; nutrition standards or rules that determine the quality of food served or sold in and around schools; nudging interventions promoting healthy food behaviour in the school environment; marketing restrictions on foods that do not contribute to a healthy diet in and around schools; and pricing policies to promote foods that contribute to a healthy diet in schools. Evidence was found for three of the five policies; no eligible studies were identified for marketing restrictions or pricing policies.

Direct food provision to students in schools

The evidence on direct food provision to students in schools included studies on the provision of fruit and vegetables, school meals and plain milk. In some studies of school meals, nutrition standards were included as part of the intervention, whereas other studies did not mention nutrition standards. Of the 16 studies reporting on consumption of foods that contribute to a healthy diet, 10 reported outcomes clearly favouring the intervention (one reported an increased number of healthy items consumed, and nine reported an increase in vegetable and/or fruit consumption). Fewer studies reported on consumption of foods that do not contribute to a healthy diet and most of these reported no difference in consumption of these foods. The evidence related to energy intake was mixed.

Nutrition standards or rules that determine the quality of food served or sold in and around schools

The evidence on nutrition standards or rules that determine the quality of food served or sold in and around schools mainly addressed standards or rules solely for food and one study addressed rules solely for beverages. Three studies reported on the effect of standards on the consumption of foods (excluding beverages) that contribute to a healthy diet; all studies reported outcomes clearly favouring the intervention and increasing consumption of healthier options (including vegetables in two studies and snacks meeting nutrition standards in the third study). Two studies assessed the consumption of foods (excluding beverages) that do not contribute to a healthy diet. Both studies showed favourable outcomes, with a decrease in the consumption of less healthy options. The evidence related to purchasing behaviour or sales data, however, was mixed. The one study on nutrition standards for beverages reported no difference in effect.

Nudging interventions promoting healthy food behaviour in the school environment

The evidence on nudging interventions promoting healthy food behaviour in the school environment assessed various strategies, including changes to how food was presented or positioned, changes to portion sizes, and the provision of nutrition information. Among the studies reporting on the effects of nudging interventions on consumption of foods that contribute to a healthy diet, most reported increased consumption. Similarly, favourable findings were observed for purchasing behaviour or sales data. The evidence related to energy intake was mixed.

Contextual factors

A review of contextual factors considered evidence on values towards the health outcomes of school food and nutrition policies and interventions; resource implications (including the costs and cost–effectiveness of interventions); equity and human rights; acceptability (reflecting the perspectives, attitudes and opinions of teachers, students and parents); and feasibility.

- Cost of implementation: The cost of direct food provision varied widely and was impacted by factors such as the type of school (e.g. pre-, primary or secondary; public or private), economies of scale, the type of food provided and the rurality of the area. The cost of implementing nutrition standards or rules also varied. Some studies reported increased costs associated with standards, whereas others reported no change to the food cost of meals.
- Human rights and equity: Special Rapporteurs on the right to food and on the right to health have called for the implementation of school food and nutrition policies and interventions (including those beyond the school food environment) to realize the right to health and the right to food. The impacts on equity were noted for both direct food provision (reduced educational and dietary inequities between students) and implementation of nutrition standards or rules (reduced dietary inequities in some studies).
- Acceptability of policies: The acceptability of direct food provision varied among parents and students. Concerns and complaints were raised about the food being either too healthy or not healthy enough, as well as about a lack of choice, unfamiliar or disliked food, and small portion sizes. Despite these concerns, school-based stakeholders generally expressed support for direct food provision initiatives recognizing the potential benefits for students' health. Regarding nutrition standards or rules, many studies reported that most parents supported the implementation of standards, and appreciated the focus on improving the quality of school meals. However, acceptability appeared lower among students. School-based stakeholders were largely supportive of nutrition standards, and acknowledged their role in fostering healthier eating environments. Nudging interventions appeared to be acceptable to students who were most supportive of less intrusive interventions. School-based stakeholders were also supportive of nudging interventions; however, their level of support depended on other school system factors that would support them to implement the interventions.
- Facilitators of implementation: The existence of numerous direct food provision programmes across various regions demonstrates their feasibility. Key facilitators for both development and implementation included political will and local leadership. For the establishment of nutrition standards or rules, the involvement of effective multidisciplinary policy working groups and the presence of higher-level policies or mandates served as important facilitators by providing a strong policy framework and ensuring that standards had institutional backing for implementation.
- Barriers to implementation: Key barriers to the direct provision of food and the implementation of nutrition standards or rules primarily included insufficient funds and financial challenges. For nudging interventions, the main barriers included time constraints, and lack of teacher confidence, knowledge or training.

Good-practice statement and recommendations

This good-practice statement and recommendations apply to all schools, whether public or private; pre-, primary or secondary; and in a low-, middle- or high-income country.

Good-practice statement[1]

The foods and beverages provided, served, sold or consumed at schools should be safe and contribute to healthy diets.

Statement rationale

The good-practice statement was formulated by the NUGAG Subgroup on Policy Actions based on several key considerations.

- Enabling children to achieve their full developmental potential is a human right and a critical foundation for sustainable development.
- The State Parties to the Convention on the Rights of the Child have a legal obligation to ensure that children's rights are respected, protected and fulfilled, including "through the provision of adequate nutritious food and clean drinking-water" *(5)*.
- Furthermore, "in all actions concerning children, whether undertaken by public or private social welfare institutions, … the best interests of the child shall be a primary consideration" *(5)*. State Parties to the Convention on the Rights of the Child should "ensure that the institutions, services and facilities responsible for the care or protection of children shall conform with the standards established by competent authorities, particularly in the areas of … health" *(5)*.
- Schools, where many children spend a large proportion of their time, provide a unique setting for countries to respect, protect and fulfil these rights, to help children develop a positive outlook on life and to contribute to human capital development.
- Foods that contribute to a healthy diet are nutrient-dense foods rich in naturally occurring fibre and/or unsaturated fatty acids, low in saturated fatty acids, *trans*-fatty acids, free sugars and salt, free of non-sugar sweeteners, and/or the consumption of which is associated with positive health outcomes.

WHO recommendation on food provision at school

WHO recommends using food provision at school to increase consumption of foods and beverages that contribute to a healthy diet.

(Strong recommendation)

Recommendation remarks

These remarks provide context for the recommendation and are intended to facilitate interpretation and implementation.

- Food provision refers to the foods and beverages provided as meals or snacks at school, whether provided free of charge, at a reduced price or at full price, and whether provided universally (i.e. to all children) or in a targeted manner (e.g. only to children in lower socioeconomic groups).
- The foods and beverages provided as part of school food provision should contribute to a healthy diet and be in line with nutrition standards or rules set and used in schools that are based on evidence-

[1] The good-practice statement represents a recommendation that the guideline development group determined was important to be articulated and for which it considered it sufficiently obvious that the desirable effects outweigh the undesirable effects such that no direct evidence is available because no one would conduct a study to examine the issue. The good-practice statement is therefore not based on a systematic review of research evidence and does not require formal assessments of the evidence.

informed dietary guidance, including food-based dietary guidelines, provided by a recognized authoritative scientific body.[1]

- The types and frequencies of foods and beverages provided, including meals, need to consider the local context, such as the nutritional situation, sociocultural considerations (including dietary customs), price and locally available food.
- To optimize the impact of school food provision on equity and school meal participation, and to reduce the risk of stigmatization linked to poverty, the local food security context and other socioeconomic determinants need to be considered. In settings where free or reduced-price food is provided in a targeted manner, strategies such as pre-order systems for food selection and cashless payment systems could be considered to reduce the risk of stigma.

Recommendation rationale

The recommendation was formulated by the NUGAG Subgroup on Policy Actions based on several key considerations (below and **Table 2**, pp. 25).

- Based on evidence on the effect of direct food provision in schools *(7)*, as well as the results of a rapid review update (GRADE profile 1, **Annex 8**), the group judged direct food provision in schools to have moderate desirable effects and trivial undesirable effects. The overall balance between desirable and undesirable effects was judged to probably favour the intervention. Following application of the GRADE approach (see section 2.2), the certainty of the evidence from the systematic review was considered moderate.
- The group also judged direct food provision in schools to probably be cost-effective, probably support improved health equity, probably support the realization of human rights and probably be acceptable to key stakeholders.

WHO recommendation on nutrition standards or rules

WHO recommends setting and using nutrition standards or rules to increase the availability, purchase and consumption at school of foods and beverages that contribute to a healthy diet and to decrease the availability, purchase and consumption at schools of foods and beverages that do not contribute to a healthy diet.

(Strong recommendation)

Recommendation remarks

These remarks provide context for the recommendation and are intended to facilitate interpretation and implementation.

- Nutrition standards or rules specify which foods and beverages are and are not allowed to be provided, served or sold at schools. They include nutrition standards based on nutrient- or food-based criteria and criteria related to food preparation methods or how food is served.
- The development of nutrition standards or rules should be based on evidence-informed dietary guidance provided by a recognized authoritative scientific body, considering the local context, including the nutritional situation, sociocultural considerations (including dietary customs), prices, and locally available food.
- Nutrition standards or rules may also be implemented through mandatory legal instruments to regulate food environments around schools, extending their impact beyond the school premises.

[1] A recognized authoritative scientific body is an organization supported by a government or competent national and/or international authorities that provides independent and transparent authoritative scientific advice (adapted from the definition provided by Codex Alimentarius *(6)*).

Recommendation rationale

The recommendation was formulated by the NUGAG Subgroup on Policy Actions based on several key considerations (below and **Table 3**, pp. 27).

- Based on evidence on the effect of nutrition standards or rules that determine the quality of food served or sold in schools *(7)* as well as a rapid review update (GRADE profile 2, **Annex 8**), the group judged nutrition standards or rules to have small desirable effects and trivial undesirable effects. Overall, the group judged the balance between desirable and undesirable effects to favour the intervention. Following application of the GRADE approach (see section 2.2), the certainty of the evidence from the systematic review and the rapid review update was considered low.
- The group also judged nutrition standards or rules to probably be cost-effective, probably support improved health equity and probably support the realization of human rights.

WHO recommendation on nudging interventions

WHO suggests implementing nudging interventions that modify the food environment at school to increase selection, purchase and consumption of foods and beverages that contribute to a healthy diet, particularly when multiple nudging interventions are implemented.

(Conditional recommendation)

Recommendation remarks

These remarks provide context for the recommendation and are intended to facilitate interpretation and implementation.

- Nudging interventions in schools deliberately adjust the choice architecture and the context within which decisions are made. Food choice architecture relates to the various ways food options are framed to promote or demote the selection of certain food options and the subsequent influence these have on children's selections. Nudging interventions do not forbid any option or significantly change economic incentives, and they can only be implemented if healthier options are available.
- Nudging interventions change the choice architecture within which children choose from the foods available in schools. Nudging interventions can be considered as part of a comprehensive package of school food and nutrition policies and interventions but should not be implemented as an alternative to ensuring the provision of foods and beverages that contribute to a healthy diet and implementing nutrition standards.
- Nudging interventions can include, but are not limited to, changes in how foods are presented, positioned or provided (including changes to portion sizes), and the provision of nutrition information about food.
- The effectiveness of implementation of individual nudging interventions varies depending on the type of nudge. Some interventions, such as changes to how food is presented, tend to be more effective whereas others, like changes to how food is positioned, may have less impact. The implementation of multiple nudging interventions within a single setting is likely to be favourable in increasing the selection, purchase and consumption of foods and beverages that contribute to a healthy diet.

Recommendation rationale

The recommendation was formulated by the NUGAG Subgroup on Policy Actions based on several key considerations (below and **Table 4**, pp. 29).

- Based on evidence on the effect of nudging interventions promoting healthy food behaviour in the school food environment *(7)* as well as a rapid review update (GRADE profile 3, **Annex 8**), the group judged nudging interventions to have trivial undesirable effects. The overall balance between desirable and undesirable effects was judged to probably favour the intervention, but nudging interventions can only be implemented if healthier options are available. Following application of the GRADE approach

(see section 2.2), the overall certainty of the evidence from the systematic review and rapid review update was considered low to moderate.

- The group also judged nudging interventions to probably support improved health equity and probably be acceptable to key stakeholders.

Key considerations for implementation

The recommendations in this guideline should be adapted to the local context of WHO regions and Member States, considering factors such as the country's nutritional situation, sociocultural and socioeconomic context, locally available food, food security and climate change vulnerabilities, dietary customs, available infrastructure, resources and capacities, and existing policies, legal frameworks and governance structures.

The global framework developed by WHO and UNESCO for making every school a health-promoting school provides a foundational whole-of-school approach for implementing the guideline's recommendations, alongside other elements that make up a nutrition-friendly school, including awareness and capacity-building of the school community, a nutrition and health–promoting curriculum, supportive school nutrition and health services. The recommendations in this guideline should be considered alongside other relevant guidance and recommendations, including from partner organizations, to ensure a coordinated approach to promoting healthy eating habits, improving nutrition and enhancing the well-being of children.

1. Introduction

1.1 Background

Good nutrition is key to ensuring optimal growth, health and well-being during childhood and beyond *(8–11)*. Healthy dietary practices, which form the foundation for good nutrition, should be initiated early in life. These early healthy practices can reduce the risk of noncommunicable diseases (NCDs) throughout life and can have an intergenerational impact *(8, 12, 13)*. Ensuring children have access to a healthy diet will support optimal health and growth *(1)*. During early childhood and throughout school age, children are also exposed to a variety of dietary risks and influences that shape their food-related decisions. Changing food preferences, combined with unhealthy influences (such as the increased availability and marketing of foods that do not contribute to a healthy diet), impact children's dietary behaviours, potentially leading to poor nutrition and health.

Unhealthy diets among children pose a major global public health risk as they can lead to all forms of malnutrition including undernutrition; micronutrient deficiencies; and overweight, obesity and diet-related NCDs among children *(14, 15)*. In 2022, 45.4 million children under the age of 5 years were affected by wasting – of whom 13.6 million were affected by severe wasting – and 148.1 million children under the age of 5 years were affected by stunting. Among children aged 5–19 years in 2022, 65.1 million girls and 94.2 million boys had obesity, an increase of 51.2 million and 76.7 million, respectively, from 1990 *(16)*. Alarmingly, there has been virtually no progress in reducing the prevalence of childhood overweight *(17)*, highlighting the urgent need for targeted interventions to address growing health concerns.

Every country in the world is affected by one or more forms of malnutrition, which threatens the survival, growth and development of children, as well as economies and nations *(18)*. Combating malnutrition in all its forms is considered one of the greatest global health challenges *(19, 20)*. The causes of malnutrition are complex, and action is required on many fronts *(21–24)*. There is wide recognition that structural changes, including changes to social, cultural, political and physical environments, are required to promote healthy diets *(25)*. Without these structural changes, behaviour change interventions alone have had limited success in reducing disease risk factors *(26)*. In alignment with the work of the World Health Organization (WHO) on creating supportive environments for health (*27–29)*, key actions to improve diets focus on modifying the food environment. The food environment refers to the surroundings that influence and shape consumers' food behaviours, preferences and values, and drive their food decisions *(30)*.

Governments play a leading role in addressing malnutrition and reducing the burden of diet-related NCDs. For example, through the implementation of public policies that create food environments conducive to healthy diets *(31–33)* and through effective regulation of private sector activities that impact health – that is, the commercial determinants of health *(29, 34)*. The private sector, however, continues to influence public health policy and regulation, including through actions such as lobbying and other means *(34)*. This ongoing influence can create challenges in implementing policies that prioritize public health over commercial interests, underscoring the need for strong, evidence-based governance to promote healthier food environments and reduce the risk of diet-related diseases.

As most children globally are enrolled in school, schools serve as unique settings for promoting health *(35)* and play an important role in supporting healthy diets and good nutrition. Schools can provide an enabling food environment that encourages healthy behaviours among school-aged children *(36, 37)*. Recognizing the established link between good nutrition and education, it is also essential to consider the physical or built environment in schools. In addition to nutrition education, strengthening the built environment and delivery of health services in schools – such as ensuring adequate sun protection, safe drinking-water,

adequate handwashing and ablution facilities, safe spaces for children to undertake physical activity and accessible school mental health services – is crucial. This comprehensive, whole-of-school approach promotes health, and children who have good health and who are well nourished tend to perform better academically and have better well-being *(38–40)*. A good education therefore lays the foundation for future success, contributing to a nation's economic and social development *(41, 42)*.

Recent systematic reviews indicate that modifications to the school food environment can positively influence children's dietary behaviours, and affect their body composition *(43, 44)*. However, disparities in the healthfulness of school food environments continue to exist *(45)* and much work remains to be done to ensure that all schoolchildren benefit from healthy school food environments *(46)*. The Lancet series on adolescent nutrition emphasizes the importance of strong regulation and enforcement of policies and programmes to shape the food environment, including those related to food sold in and around schools *(37, 47)*.

The role of schools in promoting public health has been widely acknowledged in recent decades, including by initiatives such as the WHO Global School Health Initiative, launched in 1995. This initiative introduced the health-promoting schools approach, which characterizes health-promoting schools as those that continuously strengthen their capacity to serve as a healthy setting for living, learning and working. Nutrition is considered an essential element of a health-promoting school *(35, 48)*. Several initiatives from WHO and partner agencies – including the United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Children's Fund (UNICEF), World Food Programme (WFP) and Food and Agriculture Organization of the United Nations (FAO) – encourage governments to adopt policies that support healthy food offerings at school, nutrition education and capacity-building within schools, as well as restricting the sale, marketing and sponsorship of foods and beverages high in fat, salt and/or and sugar that do not contribute to a healthy diet *(49–53)*.

A review of supporting the Nutrition-Friendly Schools Initiative (NFSI), the key nutrition component of the health-promoting schools approach, identified a strong evidence base for creating school food environments that foster healthy diets *(54)*. The review showed that school meal standards, policies that regulate foods and beverages sold outside schools, school meal programmes and school food procurement policies positively impacted the availability, purchase and consumption of healthier food. In addition, studies that assessed the impact of restrictive nutrition policies on sales of foods and beverages suggested a significant, but limited, decrease in the sales of banned foods, such as chips and sugar-sweetened beverages *(54)*. However, the evidence regarding the effects of nutrition initiatives in schools on weight-related outcomes was less conclusive, possibly because improvements in weight outcomes often take longer to manifest and are challenging to capture in the shorter term *(54)*.

In low-income or disadvantaged settings, school feeding programmes aimed at reducing undernutrition showed positive effects, such as improved weight gain, energy intake and micronutrient status *(54)*. Additionally, providing free or subsidized fruit and vegetables often led to increased consumption *(54)*. Despite children's exposure to food marketing, policies or guidelines to restrict marketing were uncommon and compliance with existing guidelines was often lacking *(54)*. Overall, the findings of the review suggest that comprehensive nutrition-related school policies using multiple approaches and addressing multiple programme areas are associated with favourable dietary, weight-related and other health outcomes among schoolchildren *(54)*.

The importance of addressing all forms of malnutrition within the school setting has been underscored in several key global initiatives, including the Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition *(55)* in 2012 and the Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020[1] *(56)* in 2013, and at the Second International Conference on Nutrition *(32, 57)* in 2014. Additionally, the 2016 report of the WHO Commission on Ending Childhood Obesity emphasized the importance of comprehensive programmes that promote healthy school environments *(58)*. In its final report, the Commission recommended that schools and childcare settings be mandated to create healthy food environments *(58)*.

[1] The Seventy-second World Health Assembly extended the period of the global action plan to 2030 to ensure its alignment with the 2030 Agenda for Sustainable Development.

Food provision at school has gained renewed political momentum due to advocacy efforts aimed at ensuring school meals for all children. For example, as of November 2024, the School Meals Coalition, comprises 105 member countries and a wide range of partners, including the FAO, UNESCO, UNICEF, WFP and WHO, and advocates for providing all children access to healthy and nutritious meals at school, helping them to realize their full potential. The coalition aims to improve and scale up school meal programmes to ensure that every child can receive a healthy, nutritious meal in school by 2030 *(59)*.

1.2 Scope and purpose

Despite evidence supporting the effectiveness of school food and nutrition policies and interventions, their implementation remains lacking in some countries. According to the Global database on the Implementation of Food and Nutrition Action (GIFNA), as of October 2025, 104 Member States have policies for healthy school food. Of these, 60 Member States include mandatory criteria for healthy school food, 15 include mandatory and voluntary criteria, and 29 include voluntary criteria. In 19 Member States these policies include nudges for healthy food in schools (**Fig. 1**). Countries are starting to make progress on marketing restrictions in schools with 48 Member States having policies. Of these, 29 have mandatory policies, five mandatory and voluntary policies, and 14 voluntary policies. In seven Member States, these marketing restrictions policies cover areas around schools (**Fig. 2**).

Despite some progress in implementing these policies to promote healthy diets in and around the school environment, governments continue to face challenges in their attempts to develop and implement supportive policies, which often result in weakened, delayed or defeated policies.

It is important to note that no single intervention can ensure that all elements of the school food environment promote and support healthy diets. Rather, a coordinated and comprehensive set of policy actions are required. As such, guidelines have been developed to support multiple policy options in addition to those

Fig. 1 Countries with criteria for healthy school food as of 2025

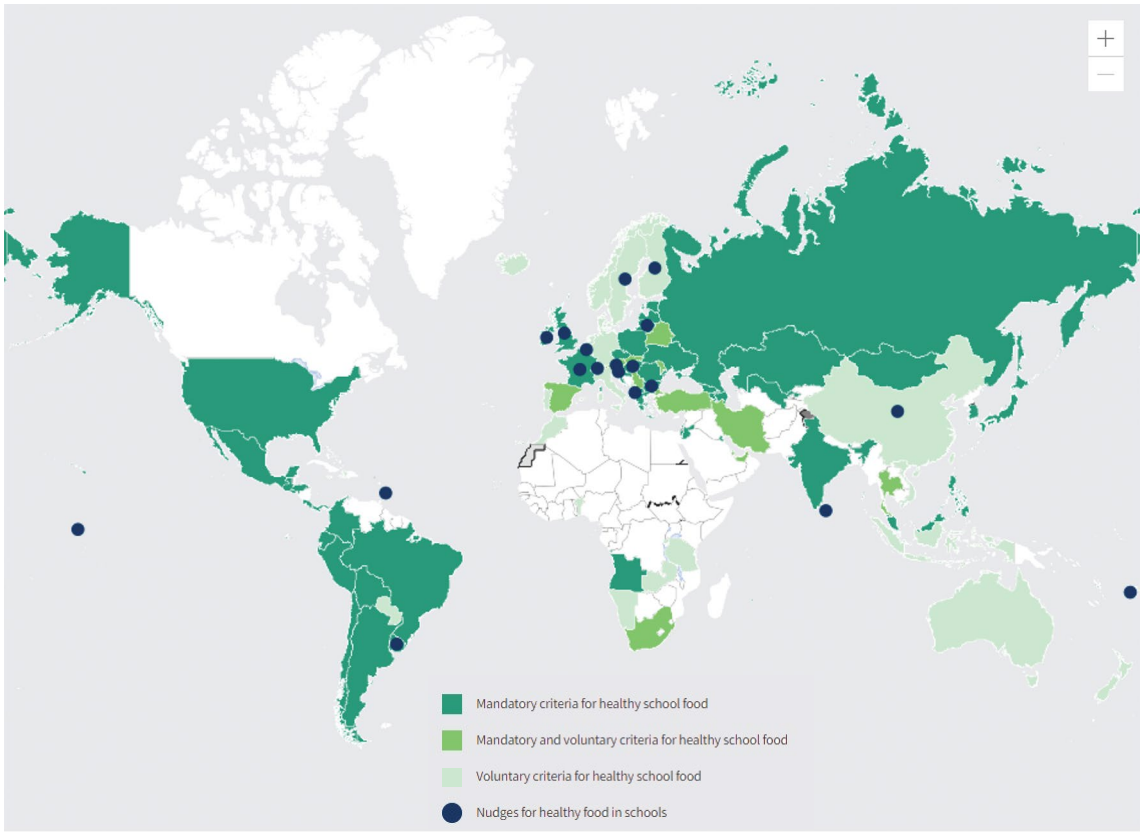
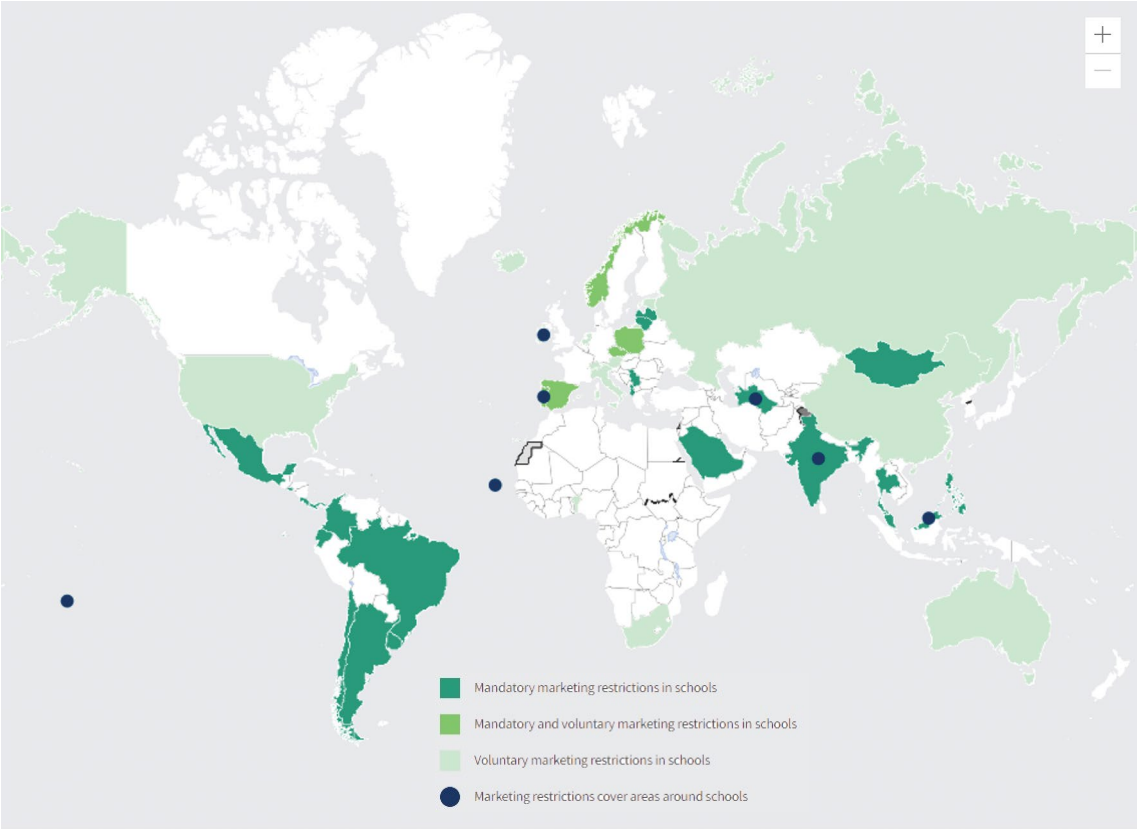


Fig. 2 Countries with marketing restrictions in schools as of 2025



which support healthy diets within the school environment, including nutrition labelling policies *(60)*, fiscal policies *(61)* and policies to protect children from the harmful impact of food marketing *(2)*.

In response to requests from Member States and to strengthen and streamline support for development and implementation of new or improved school food and nutrition policies and interventions, WHO began developing this guideline.

A scoping review of the existing evidence on school food and nutrition policies and interventions was conducted to help inform the development of this guideline *(62)*. The review focused on policies and interventions that addressed the school community, curriculum, food environment, and nutrition and health services. These four policy areas were selected because they are commonly addressed by school food and nutrition policies and interventions and align with the pillars of school-based health initiatives including the NFSI, the WHO health-promoting schools framework and FRESH. Following discussions with the WHO Steering Committee and the Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Policy Actions, the scope of this guideline was refined to focus solely on interventions that affect the school food environment. Recommendations regarding nutrition services in schools are available in the WHO guideline on school health services *(63)*.[1] The WHO standards for water, sanitation and hygiene in schools are also relevant *(64)*. The WHO–UNESCO global standards for making every school a health-promoting school further guide efforts to establish health-promoting education systems by emphasizing the importance of health-promoting schools within a governance framework *(35)*. Other frameworks are also available. For example, the FAO School Food and Nutrition Framework helps countries to identify synergies

[1] The WHO guideline on school health services makes recommendations on 87 interventions. These include promotion of reduced consumption of sugar-sweetened beverages; promotion of increased physical activity and limited sedentary behaviour; provision of health education about nutrition; screening for nutritional problems; referral and support for management of anaemia (e.g. iron supplementation); iron, folic acid and other micronutrient supplementation; referral and support for overweight and obesity; counselling on nutrition, physical activity and a management plan, if needed; and other services relevant to prevention of malnutrition, such as promotion of personal hygiene and handwashing with soap.

to improve school food and nutrition while also supporting value chains and creating market and financial opportunities for local smallholder producers, contributing to community economic development *(65)*.

The scope of this guideline includes policies and interventions that influence the school food environment. In-scope interventions for which evidence-informed recommendations were made[1] included:

- direct food provision to students in schools (e.g. school meal programmes, vegetable and fruit distribution, and milk provision);
- nutrition standards or rules that determine the quality of food served or sold in and around schools (e.g. in school canteens or tuckshops, cafeterias and/or vending machines on school premises); and
- nudging interventions promoting healthy food behaviours in the school environment (e.g. product placement).

The recommendations in this guideline are intended for all schools (i.e. pre-, primary and secondary schools, and whether public or private).

This guideline is not an implementation manual. It does not describe how countries can implement and monitor school food and nutrition policies and interventions, but rather recommends what measures to take. Implementation guidance can be found in various implementation manuals (see section 5.4).

1.3 Objectives

The objectives of this guideline are to:

- provide evidence-based recommendations and implementation considerations on school food and nutrition policies and interventions to improve school food environments;
- enable evidence-informed advocacy to advance action on school food and nutrition policies and interventions;
- guide future research to further strengthen the evidence base for action on school food and nutrition policies and interventions; and
- contribute to the creation of food environments that enable healthy dietary practices among children.

This guideline is one of several WHO guidelines to improve the food environment. The overarching objective of these guidelines is to contribute to the achievement of healthier populations through multisectoral approaches, in line with the WHO Fourteenth General Programme of Work (2025–2028) *(66)*. WHO guidelines on policies to improve the food environment will also contribute to implementation of additional calls to action relating to nutrition and health (**Annex 1**).

1.4 Target audience

The guideline is intended for a wide audience involved in the development, design, implementation, monitoring and evaluation of school food and nutrition policies and interventions, as well as those involved in compliance with, and advocacy for, such policies. The end users for this guideline are thus:

- national and local policy-makers involved in developing, designing, implementing, monitoring or evaluating school food and nutrition policies and interventions;
- implementers and managers of national and local school health and nutrition programmes, including school administrators, teachers and educators, and school healthcare workers;
- organizations (including nongovernmental organizations) and professional societies involved in advocating for, developing and evaluating school food and nutrition policies and interventions;

[1] Two additional interventions were initially defined as in-scope: marketing restrictions on foods that do not contribute to a healthy diet in and around schools, and pricing policies to promote foods that contribute to a healthy diet in schools. However, the systematic review conducted as part of the guideline's development found no direct evidence for these two policies in school settings. The guideline development group therefore proposed referring to the WHO guideline on policies to protect children from the harmful impact of food marketing *(2)* and the WHO guideline on fiscal policies to promote healthy diets *(61)*. The implementation of these guidelines at the national level would impact school settings.

- health professionals, including nutrition professionals and those working in school health and nutrition programmes;
- scientists and other academic actors involved in relevant research (including policy evaluation); and
- representatives of school food procurement services and implementing food service providers including school cooks and chefs.

2. How this guideline was developed

This guideline was developed in accordance with the WHO process for development of evidence-informed guidelines outlined in the *WHO handbook for guideline development (67)*. This chapter describes the contributors to the guideline development process and the steps taken.

2.1 Contributors to guideline development

This guideline was developed by the WHO Department of Nutrition and Food Safety and other members of the WHO Secretariat (**Annex 2**), together with the contributors described below.

WHO Steering Committee

An internal steering committee (**Annex 3**) provided input to development of the guideline. The WHO Steering Committee included representatives from relevant departments in WHO with an interest in the provision of advice on food environment policies, determinants of health, health promotion, and maternal and child health.

Guideline development group

A guideline development group (**Annex 4**) – the WHO NUGAG Subgroup on Policy Actions – was convened with the main functions of determining the scope and key question of the guideline (including the target population, intervention, comparator and outcomes of interest), reviewing the evidence and formulating evidence-based recommendations. The NUGAG Subgroup on Policy Actions included experts identified through an open call for experts in 2018, and people who had participated in previous WHO expert consultations or were members of WHO expert advisory panels. In forming the group, the WHO Secretariat considered the need for expertise from multiple disciplinary areas, representation from all WHO regions and a balanced gender mix. Efforts were made to include experts in complex interventions; development and/or implementation of school food and nutrition policies and interventions; and systematic review, programme evaluation and Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodologies.

External contributors

Various external contributors provided input and review during development of the guide (**Annex 5**). External resource people, including methods experts and members of the systematic review teams, attended the meetings of the NUGAG Subgroup on Policy Actions. The systematic review team was led by Ms Solange Durão, Cochrane South Africa. It undertook a systematic review *(7)* and rapid review update to support development of the guideline. External peer reviewers were identified in consultation with WHO regional nutrition advisers from all WHO regions, representing academia, civil society and government. The external peer review took place in March 2025.

2.2 Guideline development process

Scoping of the guideline

A scoping review of existing evidence was prepared by Ms Solange Durão, Cochrane South Africa, and presented to the WHO Steering Committee to help determine the scope of the guideline *(62)*. The internal WHO Steering Committee and the NUGAG Subgroup on Policy Actions finalized the scope of the guideline

as policies and interventions that influence the school food environment to avoid duplication of the WHO guideline on school health services *(63)*.[1]

Formulation of the key question and prioritization of outcomes

School food and nutrition policies and interventions are a priority policy option for creating food environments that contribute to healthy diets, and are implemented within complex systems (including the food system), that are country-specific, and influenced by political, legal, economic, cultural and ethical contexts. As proposed in the *WHO handbook for guideline development*, logic models can be used during guideline planning to show interventions of interest and elements of the system in which they are implemented to help formulate guideline questions *(67)*. **Fig. 3** shows a logic model depicting pathways from school food and nutrition policies and interventions to behavioural, health and educational outcomes. It shows country context policy inputs and considerations, including potential interactions with other, complementary food environment policies, which can amplify the policy of interest's impact.

The research question was formulated using the population, intervention, comparator and outcome (PICO) format, based on the scoping review and taking the logic model into consideration. A draft PICO question was first discussed and reviewed by the WHO Secretariat, the WHO Steering Committee and the NUGAG Subgroup on Policy Actions. All potentially important outcomes were identified and discussed by the group, followed by an anonymous online rating of outcomes on a scale from 1 to 9. Outcomes rated 7–9 were considered critical for decision-making, and those rated 4–6 were considered important. Those rated 1–3 were dropped from the PICO question.

The NUGAG Subgroup on Policy Actions noted several challenges to assessing longer-term health outcomes.

- The policies and interventions under consideration may have been only recently introduced, whereas changes to outcomes such as anthropometric outcomes (e.g. body mass index (BMI), weight-for-height and height-for-age) occur gradually.
- There are methodological challenges in disentangling the impact of school food and nutrition policies and interventions from the complex array of factors that contribute to outcomes such as anthropometric outcomes.
- There is a need to be realistic about the extent to which any one intervention can be expected to impact outcomes such as anthropometric outcomes on its own. Instead, school food and nutrition policies and interventions are intended to contribute to such outcomes as part of a comprehensive package of policy actions.

Nonetheless, the group ranked several longer-term health outcomes as important to ensure that the breadth and depth of current evidence were captured and considered in the guideline, and to highlight potential research and knowledge gaps and data challenges to strengthen the evidence base for future updates to this guideline. The selection of outcomes of interest when defining research questions should not be based on outcomes for which evidence is known to be available, but rather should provide the opportunity to explore the unknown and highlight data gaps.

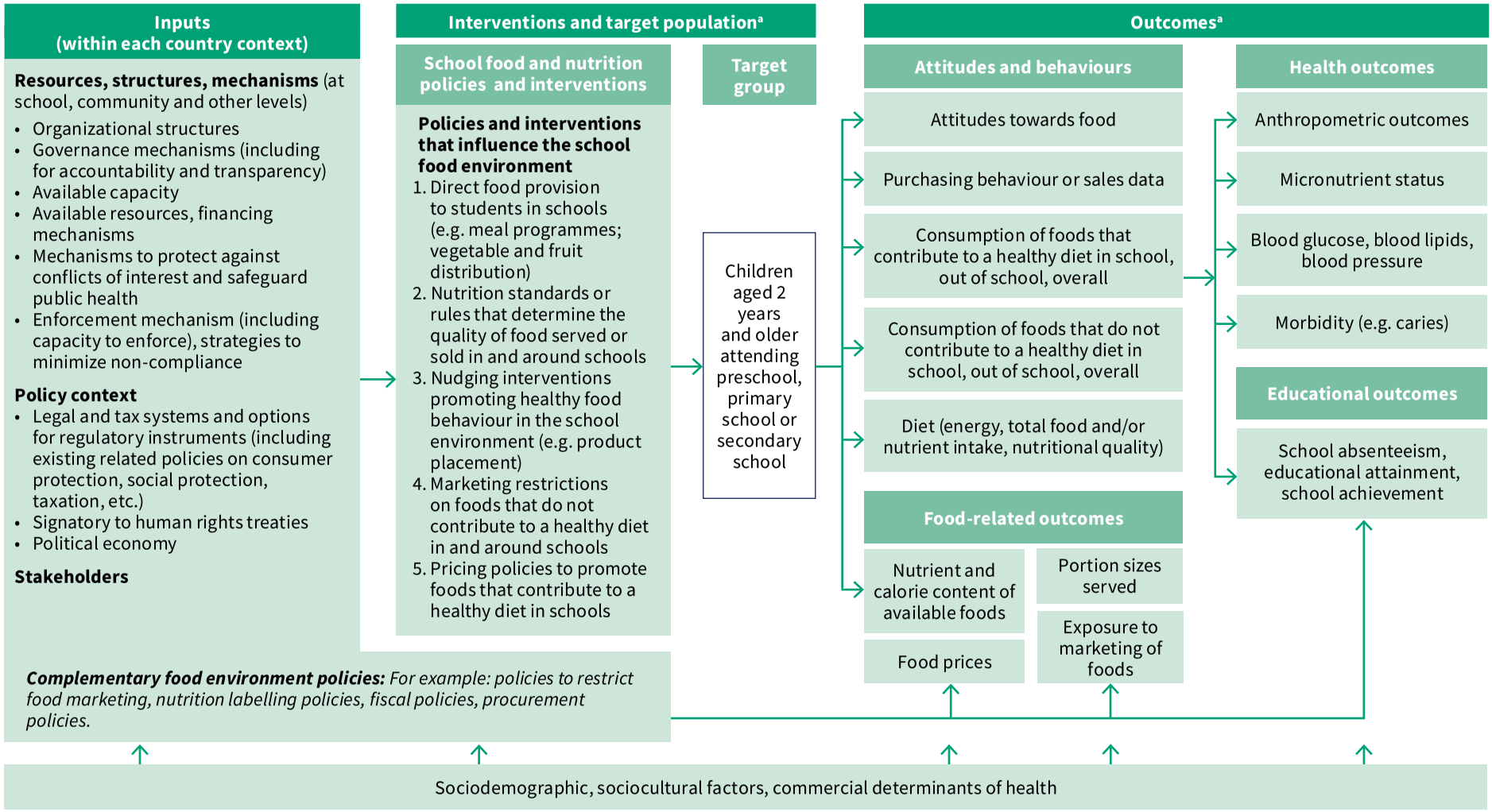
The PICO question was as follows.

What is the effect in children on the outcomes of interest of implementing policies or interventions that influence the school food environment compared with not implementing the policy or intervention?

Table 1 provides details of the key question in PICO format.

[1] The WHO guideline on school health services makes recommendations on 87 interventions. These include promotion of reduced consumption of sugar-sweetened beverages; promotion of increased physical activity and limited sedentary behaviour; provision of health education about nutrition; screening for nutritional problems; referral and support for management of anaemia (e.g. iron supplementation); iron, folic acid and other micronutrient supplementation; referral and support for overweight and obesity; counselling on nutrition, physical activity and a management plan, if needed; and other services relevant to prevention of malnutrition, such as promotion of personal hygiene and handwashing with soap.

Fig. 3 Logic model depicting pathways from school food and nutrition policies and interventions within the scope of this guideline to health and educational outcomes



[a] Interventions and outcomes shown in the figure are those prioritized by the members of the WHO NUGAG Subgroup on Policy Actions in formulating the research question for the evidence review to inform the guideline on school food and nutrition policies and interventions.

Table 1. Population, intervention, comparator and outcomes for key question

Measure	Key question
Population	Children aged 2 years and older attending pre-, primary or secondary school (public or private) Disaggregation by age, school level (pre-, primary and secondary), SES (including of parents) and country income group (HICs, UMICs, LMICs and LICs)
Intervention	Policies and interventions that influence the school food environment, including: • direct food provision to students in schools (e.g. school meal programmes, and vegetable and fruit distribution); • nutrition standards or rules that determine the quality of food served or sold in and around schools (e.g. in school canteens, cafeterias, and vending machines) • nudging interventions promoting healthy food behaviours in the school environment (e.g. product placement); • marketing restrictions on foods that do not contribute to a healthy diet in and around schools; and • pricing policies to promote foods that contribute to a healthy diet in schools
Comparator	No new policy or intervention, an existing policy or intervention, or a weaker policy or intervention
Critical outcomes for decision-making	Consumption of foods that contribute to a healthy diet[a] (e.g. fruit and vegetables) in school, out of school or overall Consumption of foods that do not contribute to a healthy diet (e.g. sugar-sweetened beverages) in school, out of school or overall Diet (energy, total food and/or nutrient intake, and nutritional quality) Purchasing behaviour or sales data Nutrient and calorie content of available food Exposure to food marketing food, when relevant
Important outcomes	Anthropometric outcomes (e.g. BMI, weight-for-height and height-for-age) Behaviours related to healthy dietary habits Educational outcomes (school absenteeism, educational attainment and school achievement) Micronutrient status Prices of available food and beverages Portion sizes served Attitudes towards food and beverages Blood glucose, blood lipids (TC, LDL-C, HDL-C and TG) and blood pressure Morbidity (e.g. caries)

HDL-C: high-density lipoprotein cholesterol; HIC: high-income country; LDL-C: low-density lipoprotein cholesterol; LIC: low-income country; LMIC: lower middle-income country; SES: socioeconomic status; TC: total cholesterol; TG: triglycerides; UMIC: upper middle-income country.

[a] As defined by the authors of the primary studies.

The NUGAG Subgroup on Policy Actions requested an additional review to provide information on contextual factors that would be considered in the formulation of the recommendations, such as resource implications, equity and human rights, acceptability and feasibility. The contextual factors in the review included those outlined in the *WHO handbook for guideline development* (Chapters 10 and 18) *(67)*. Extra questions were formulated to guide the review of contextual factors (**Annex 6**).

Evidence gathering and grading

Evidence gathered for this guideline included a:

- systematic review on the effectiveness of policies and interventions that influence the school food environment *(7)* and a rapid review update;[1] and
- review of contextual factors (values, resource implications, equity and human rights, acceptability, and feasibility) *(68)*.

The systematic review team conducted the systematic review to address the key question in PICO format (**Table 1**). The systematic review search was conducted in April–May 2020 and the systematic review was published in June 2023 *(7)*. To update the evidence, a rapid review of the literature to October 2023 was conducted, as described in **Annex 7**.

The review of contextual factors was conducted by WHO and involved literature searches for systematic reviews, primary studies and grey literature that provided information on values, resource implications, equity and human rights, acceptability and feasibility *(68)*.

In line with the guideline development process, the certainty of the body of evidence for individual outcomes gathered through the systematic review and the rapid review update was assessed by the systematic review team using the GRADE approach. GRADE provides a transparent approach to grading the certainty of evidence for individual outcomes included in key questions. For this guideline, the certainty of evidence was only graded for the critical outcomes and one important outcome (anthropometric outcomes). Following the rapid review update, the certainty of evidence was reassessed overall and across outcomes and updated as necessary. Further, where both randomized trial and observational study evidence was available for any of these outcomes, only the randomized trial evidence was graded. The certainty of evidence indicates the level of confidence that the effects of an intervention observed in a body of evidence (i.e. a set of scientific studies) reflect the true effects that would occur in real-world settings.

Using the GRADE approach, there are four possible assessments for the overall certainty of the evidence for an outcome *(69)*:

- very low (very low level of confidence in the effect estimate – the true effect is likely to be substantially different from the effect estimate);
- low (low level of confidence in the effect estimate – the true effect may be substantially different from the effect estimate);
- moderate (moderate level of confidence in the effect estimate – the true effect is likely to be close to the effect estimate, but there is a possibility that it is substantially different); and
- high (high level of confidence in the effect estimate – the true effect is likely to be close to the effect estimate).

The starting point for assessing the overall certainty of the evidence for an outcome depends on the design of the studies contributing to the evidence base. Evidence from observational studies starts at low certainty due to potential residual confounding, while evidence from randomized controlled trials (RCTs) begins at high certainty. Many studies assessing the effectiveness of school food and nutrition policies and interventions are observational, meaning the certainty of evidence often starts at low. The overall certainty of evidence for each outcome in the systematic review was assessed by considering five factors for potentially downgrading the certainty: risk of bias, inconsistency, indirectness, imprecision and publication bias, as defined and used in the GRADE approach. Additionally, three factors were considered for potentially upgrading the certainty: a large effect size, the absence of plausible confounding factors that could reduce the observed effect, and the presence of a dose–response gradient. These considerations help determine the robustness and reliability of the evidence, guiding the formulation of recommendations based on the available data.

[1] The results of the rapid review update for the critical outcomes and one important outcome (anthropometry) are shown in GRADE evidence profiles (Annex 8) and harvest plots (Chapter 3). Annex 7 provides further information on the rapid review update.

For each GRADE factor, judgements were made by two members of the systematic review team. The judgements, and their rationale, were recorded in GRADE evidence profile tables (**Annex 8**). The certainty of evidence was not assessed for the contextual factors review.

Formulation of the recommendations

The NUGAG Subgroup on Policy Actions discussed and assessed the evidence, drafted recommendations and reached consensus on the direction and strength of the recommendations using the GRADE approach.

After reviewing the ratings for the certainty of evidence for each critical and important outcome (where available), the NUGAG Subgroup on Policy Actions made a judgement on the overall certainty of evidence by reflecting on the validity, precision, consistency and applicability of the measures of effect, taking into consideration the pathway of effect of the entire body of evidence. The GRADE approach explicitly separates the process of assessing the level of certainty in the evidence from the process of making recommendations. The latter process takes into consideration several additional contextual factors (resource implications, equity and human rights, acceptability and feasibility) *(69)*. The level of certainty of evidence does not imply a particular strength of recommendation; high certainty evidence does not necessarily mean that a strong recommendation will be made, and a strong recommendation can be made with low or very low certainty evidence, depending on additional considerations.

Evidence-to-decision tables were used to structure and document the discussion of the evidence and decision criteria for the recommendations on the direct food provision to students in schools (see **Table 2**), nutrition standards or rules that determine the quality of food served or sold in and around schools (see **Table 3**), and nudging interventions promoting healthy food behaviour in the school environment (see **Table 4**). Anonymous online voting was used to arrive at an initial judgement for each factor. Following the voting, initial judgements were discussed until the group reached consensus. Based on the evidence of effectiveness and additional contextual factors, the NUGAG Subgroup on Policy Actions developed recommendations and associated remarks by consensus.

2.3 Management of conflicts of interest

According to the rules in the WHO *Basic documents (70)*, whenever an expert or an individual provides independent advice to WHO, including participating in WHO meetings, a declaration of interest form must be submitted, and all declarations must be reviewed following the procedures for management of interests outlined in the *Guidelines for declaration of interests for WHO experts (71)*. In the case of guideline development, this includes all members of the guideline development group (for this guideline, the NUGAG Subgroup on Policy Actions), individuals who prepare systematic reviews and evidence profiles, and any other experts (including external peer reviewers) who participate in the process of guideline development in an individual capacity. Before every meeting, the members of the NUGAG Subgroup on Policy Actions, the members of the systematic review team and other experts who would be participating in the meeting were asked to submit their updated declaration of interest forms. In addition to distributing the declaration of interest form, the WHO Secretariat described the declaration of interest process and provided an opportunity during meetings for guideline development group members to declare any interests not provided in written form. All declared interests were reviewed by the WHO Secretariat in consultation with the Office of Compliance, Risk Management and Ethics, as necessary. A summary of declared interests and the assessment of these interests is provided in **Annex 9**.

3. Summary of evidence

Evidence was gathered via a systematic review on the effectiveness of policies and interventions that influence the school food environment *(7)*, a rapid review update and a review of contextual factors *(68)*.

3.1 Evidence on effectiveness of policies and interventions that influence the school food environment

A total of 74 studies were included in the systematic review on the effectiveness of policies and interventions that influence the school food environment *(7)*. An additional 22 studies were identified in the rapid review update. **Table 1** (pp. 10) outlines the population, intervention, comparator and outcomes that guided the review and **Annex 8** provides the GRADE evidence profiles. To identify relevant studies for the systematic review, a search was conducted in April–May 2020. The rapid review update covered the literature up to October 2023 to complement the systematic review. Studies assessing multicomponent policies or interventions were included when the effect of the intervention component of interest could be ascertained; studies in which this could not be ascertained were excluded. The systematic review and rapid review update included a total of 96 studies, consisting of 45 cluster randomized controlled trials (cRCTs), 40 prospective controlled studies, eight uncontrolled interrupted time series studies, and three randomized controlled trials (RCTs).[1] Most of the studies (n = 81) were conducted in HICs.

The included studies were grouped as follows:

- direct food provision to students in schools (*n* = 46 (43 studies identified in the systematic review plus 3 studies identified in the rapid review update));
- nutrition standards or rules that determine the quality of food served or sold in and around schools (*n* = 17 (9 studies identified in the systematic review plus 8 studies identified in the rapid review update)); and
- nudging interventions promoting healthy food behaviour in the school environment (*n* = 33 (23 studies identified in the systematic review plus 10 studies identified in the rapid review update)).

No eligible studies were identified for marketing restrictions on foods that do not contribute to a healthy diet in and around schools, nor for pricing policies to promote foods that contribute to a healthy diet in schools.

Due to substantial heterogeneity among the included studies and the lack of data provided by some studies, vote counting using five effect directions was used as the main approach to synthesis. The five effect directions were: clear effect favouring the intervention, unclear effect potentially favouring the intervention, no difference in effect, unclear effect potentially favouring the control, and clear effect favouring the control. The approach helped to provide a broad summary of the results across studies despite their variability. When possible, meta-analyses were conducted for subsets of studies that shared the same design, comparison and outcome measure.

For the critical outcomes and one important outcome (anthropometric outcomes), when a study reported multiple measures for the same outcome, a single measure was selected for inclusion in the synthesis to avoid double counting. The measures selected for synthesis were those considered by the guideline development group to be the most comprehensive, validly measured and relevant for decision-making (e.g. BMI instead

[1] As the scoping review identified the existence of many studies using controlled and/or longitudinal study designs, cross-sectional studies were excluded.

of weight and height). Details of all measures reported by each study for each of the outcomes are, however, included in the supplementary material of the published systematic review *(7)*.

No evidence was found – for any intervention – for the critical outcomes of exposure to food marketing in and around schools, nor for the important outcomes of prices of available food and portion sizes served.

Due to the nature of the data included, it was not possible to complete subgroup analyses by age, school level (pre-, primary and secondary), SES (including of parents) or country income group (i.e. HICs, UMICs, LMICs and LICs).

Direct food provision to students in schools

A total of 43 studies on direct food provision to students in schools were included in the systematic review. An additional three studies were identified in the rapid review update. These assessed provision of fruit and vegetables (n = 17), school meals (n = 27) and milk (n = 2).

For fruit and vegetable provision, most programmes provided fruit and vegetables daily or several times a week. One study compared a free and a paid fruit and vegetable subscription.

Studies that evaluated school meal provision (n = 27) mostly involved provision of breakfast, followed by provision of lunch and provision of more than one meal per day. In some studies of school meals, nutrition standards were included as part of the intervention description, whereas other studies did not mention any nutrition standards. Studies that evaluated milk provision assessed the daily provision of milk.

Fig. 4 shows the effects of direct food provision on the four critical outcomes for which evidence was available and one important outcome (anthropometry). The remaining important outcomes are summarized narratively. Studies were only included in **Fig. 4** if they compared provision with no provision (e.g. two studies on meal provision reported on a different comparison – universal free access compared with income-based access to school meals – and so were not included in **Fig. 4**). For the outcome of dietary intake, studies were only included in **Fig. 4** if they reported energy intake; energy intake was prioritized over other dietary intake measures as the most relevant measure. For the anthropometric outcome, studies were only included in **Fig. 4** if the intervention was aimed at preventing or reducing overweight and, for trials, if they reported BMI or BMI z-score or, for prospective controlled studies, if they reported the proportion of children with overweight or obesity.

Sixteen studies reporting on consumption of foods that contribute to a healthy diet were included in **Fig. 4**. Of the 16 studies, 10 studies (nine of fruit and vegetable provision and one of meal provision) reported effects clearly favouring the intervention, two (both of fruit and vegetable provision) reported effects potentially favouring the intervention, and four (three of fruit and vegetable provision and one of meal provision) reported no difference in effect.

Four studies reporting on consumption of foods that do not contribute to a healthy diet were included in **Fig. 4**. Of the four studies, one study (of fruit and vegetable provision) reported effects potentially favouring the intervention and three (one of fruit and vegetable provision and two of meal provision) reported no difference in effect.

Four studies reporting on energy intake were included in **Fig. 4**. Two of the four studies examined prevention or reduction of overweight while the other two studies examined prevention or reduction of undernutrition. Of these four studies, one study (of meal provision) reported effects clearly favouring the intervention and two studies (both of meal provision) reported effects potentially favouring the intervention; and one study (of fruit and vegetable provision) reported an unclear effect potentially favouring the control. In the two studies examining prevention or reduction of undernutrition, the effects on energy intake were uncertain (after a duration of 1–3 months), with one study clearly favouring the intervention and one potentially favouring the intervention.

Only one study reporting on purchasing behaviour or sales data was included in **Fig. 4**. The study, on milk provision, reported effects clearly favouring the intervention.

Six studies reporting on anthropometric outcomes (measured through BMI (kg/m^2) and BMI z-score) to show trends in overweight and obesity were included in **Fig. 4**. Three studies (all of meal provision)

reported no difference in effect. One study (of meal provision) reported unclear effects potentially favouring the intervention, one (of fruit and vegetable provision) reported unclear effects potentially favouring the control, and one (of fruit and vegetable provision) reported effects clearly favouring the control. The study that clearly favoured the control assessed the daily provision of fruit in primary school classrooms and found that direct provision of fruit in schools may slightly increase BMI.

Behaviours related to healthy dietary habits while in schools were assessed in three studies. One study of healthy school meal provision reported on various outcome measures related to meal frequency, including the percentage of children consuming breakfast, lunch or dinner on weekdays and weekend days at 12 months. The study found effects ranging from an unclear effect potentially favouring the intervention to a clear effect favouring the control, depending on the outcome measure.

Two studies assessed the effect of fruit and vegetable provision on children's behaviours (using fruit and vegetable eating habit scores as outcome measures). One study reported a clear effect favouring fruit and vegetable provision on the proportion of children who like to eat vegetables and fruits, and the other reported no difference in effect.

Thirteen studies reported on various educational outcomes including school attendance, school dropout rates, reading scores, math scores and vocabulary scores. Eleven studies reported varying effects on school attendance – one study (of meal provision) reported a clear effect favouring the intervention, six studies (all of meal provision) either favoured or potentially favoured the intervention, one study (of meal provision) found no difference, and three studies (one of fruit and vegetable provision and two of meal provision) either favoured or potentially favoured the control. Studies similarly reported varying effects on math and reading scores (five trials reported on each outcome). One study reported a clear effect favouring meal provision on total grade point average score. Only single studies reported on school dropout rates, vocabulary scores and aggregate test scores. Most reported outcomes favouring the intervention.

Outcomes related to attitudes towards food were reported by six studies. The outcomes and effect measures were highly variable. One study on direct provision of fruit and vegetables reported a clear effect favouring the intervention, with the intervention increasing children's willingness to try new vegetables. Pooled analysis of two studies of direct food provision showed no difference in effect on children's attitudes towards fruit scores (with the same two studies also reporting an unclear effect potentially favouring the intervention and a clear effect favouring the intervention on fruit preference scores). One study reported a clear effect favouring the control on vegetable preference scores, and one study reported an unclear effect potentially favouring the intervention on willingness to try a target food. The single study on meal provision (in this case, free school breakfast) reported no difference in effect on attitudes towards eating breakfast.

Two studies reported on micronutrient status and found mostly unclear effects. Both studies, which were on meal provision, reported unclear effects potentially favouring the intervention on iron status. One also reported a clear effect favouring the intervention on vitamin B12 status and an unclear effect potentially favouring the control on folate status. The other also reported on vitamin C status (the proportion of children with unacceptable blood concentrations of ascorbic acid in the intervention group decreased whereas there were no children with vitamin C deficiency before or after the intervention in the control group; no effect measures were reported).

Studies reporting on biochemical assessments using laboratory measures (e.g. blood glucose, blood lipids and haemoglobin) found mixed results with most reporting no difference in effect between the intervention and control. One study of daily breakfast provision reported no difference in effect on fasting blood glucose between the intervention group and the control group at 9 months. Three studies reported on blood lipids. One study found a small clear effect favouring the intervention on TC and no difference in effect on HDL-C, LDL-C and TG; pooled analysis of the two other studies found no difference in effect on TC or on TG. One study reported no difference in systolic and diastolic blood pressure. For morbidity, one study reported no difference in effect on metabolic syndrome score or total well-being score, and two studies reported unclear effects potentially favouring the intervention on haemoglobin.

Fig. 4 Harvest plot of the effects of direct food provision to students in schools on selected outcomes

Outcome and certainty of evidence	Clear effect favouring the control	Unclear effect potentially favouring the control	No difference	Unclear effect potentially favouring the intervention	Clear effect favouring the intervention
Consumption of foods that contribute to a healthy diet (critical outcome) Meal provision ⨁⨁⨁◯ Fruit and vegetable provision ⨁⨁◯◯			■ ■■■	■■	■ ■■■■■■■■■*
Consumption of foods that do not contribute to a healthy diet (critical outcome) Meal provision ⨁⨁⨁◯ Fruit and vegetable provision ⨁⨁⨁◯			■■ ■	 ■	
Diet: energy intake (critical outcome) Meal provision ⨁◯◯◯ Fruit and vegetable provision ⨁⨁⨁◯		 ■		■■	■
Purchasing behaviour or sales data (critical outcome) Milk provision ⨁⨁⨁◯					■
Anthropometry: (important outcome) Meal provision ⨁⨁⨁◯ Fruit and vegetable provision ⨁⨁◯◯	 ■	 ■	■■■	■	

Each block represents one study. A black box indicates a randomized trial. An asterisk indicates a study from the rapid review update. Certainty of the evidence = ⨁◯◯◯ very low; ⨁⨁◯◯ low; ⨁⨁⨁◯ moderate; ⨁⨁⨁⨁ high.

Note: The grey shaded area is characterized by uncertainty regarding the effect (e.g. a risk ratio (RR) of 1.02 with a 95% confidence interval (CI) of 0.91–1.15 would be found under "Unclear effect potentially favouring the intervention". However, based on the 95% CI, this intervention could also be harmful). The darker grey column in the centre indicates that the 95% CI crosses the null and is narrow.

Nutrition standards or rules that determine the quality of food served or sold in and around schools

A total of nine studies (reported in seven papers) on nutrition standards or rules that determine the quality of food served or sold in and around schools were included in the systematic review. An additional eight studies were identified in the rapid review update. Only one study assessed the effect of rules to eliminate or reduce the availability of sugar-sweetened beverages and diet soda from schools. The total of 16 studies assessed nutrition standards or rules that increased availability of foods (excluding beverages) that contribute to a healthy diet[1] and/or decreased availability of foods (excluding beverages) that do not contribute to a healthy diet in schools. This included offering a choice with lower fat content; increasing availability of lower calorie products in vending machines; reducing energy content of school meals; implementing revised standards that increased availability of whole grains, fruit and vegetables; removing less healthy foods from snack

[1] As defined by the authors of the primary studies.

bars and removing vending machines from cafeterias; and implementing nutrition standards for foods available at school.

Fig. 5 shows the effects of nutrition standards or rules on the five critical outcomes for which evidence was available and one important outcome (anthropometry (BMI)). The remaining important outcomes are summarized narratively. For the outcome of dietary intake, studies were only included in **Fig. 5** if they reported energy intake; energy intake was prioritized over other dietary intake measures as the most relevant measure.

Three studies reporting on consumption of foods that contribute to a healthy diet were included in **Fig. 5**. One study (on nutrition standards or rules for food) found that nutrition standards or rules may increase the mean consumption score of snacks meeting nutrition standards (with higher scores indicating better

Fig. 5 Harvest plot of the effects of nutrition standards or rules that determine the quality of food served or sold in and around schools on selected outcomes

Outcome and certainty of evidence	Clear effect favouring the control	Unclear effect potentially favouring the control	No difference	Unclear effect potentially favouring the intervention	Clear effect favouring the intervention
Consumption of foods that contribute to a healthy diet (critical outcome) Nutrition standards for food ⨁⨁◯◯					■ ■ ■ * *
Consumption of foods that do not contribute to a healthy diet (critical outcome) Nutrition standards for food ⨁⨁◯◯ Nutrition standards for beverages only ⨁⨁◯◯			■		■ ■ *
Diet: energy intake (critical outcome) Nutrition standards for food ⨁⨁◯◯				■ *	■
Purchasing behaviour or sales data (critical outcome) Nutrition standards for food ⨁⨁◯◯		■	■	■	■ *
Nutrient and/or calorie content of available foods (critical outcome) Nutrition standards for food ⨁⨁◯◯					■ *
Anthropometry: (important outcome) Nutrition standards for food ⨁◯◯◯			■ ■ ■ *		■ ■ *

Each block represents one study. A black box indicates randomized trials. Asterisks indicate studies from the rapid review update. Certainty of the evidence = ⨁◯◯◯ very low; ⨁⨁◯◯ low; ⨁⨁⨁◯ moderate; ⨁⨁⨁⨁ high.

Note: The grey shaded area is characterized by uncertainty regarding the effect (e.g. a RR of 1.02 with a 95% CI of 0.91–1.15 would be found under "Unclear effect potentially favouring the intervention". However, based on the 95% CI, this intervention could also be harmful). The darker grey column in the centre indicates that the 95% CI crosses the null and is narrow.

results, i.e. healthier outcomes). Evidence from the other two studies indicated that nutrition standards may increase vegetable intake. The effects of all three studies clearly favoured the intervention.

Three studies reporting on consumption of foods that do not contribute to a healthy diet were included in **Fig. 5**. Two studies (on nutrition standards or rules for food) reported a clear effect favouring the intervention (one showed a lower mean consumption score for salty snacks excluded by nutrition standards, with higher scores indicating poorer results, and the other showed a reduction in consumption of refined grains and potatoes). One study on nutrition standards for beverages reported no difference in effect.

Two studies reporting on energy intake were included in **Fig. 5**. An observational study reported a clear effect favouring the intervention, while the cRCT reported potentially favouring the intervention. Evidence from this one trial indicates that nutrition standards may increase the energy content of meals provided.

Four studies reporting on purchasing behaviour or sales data were included in **Fig. 5**. Of the studies (all on nutrition standards or rules for food), one reported an unclear effect potentially favouring the control, one reported no difference in effect, one reported an unclear effect potentially favouring the intervention and one reported a clear effect favouring the intervention.

One study reporting on the nutrient and calorie content of available food was included in **Fig. 5**. It reported a clear effect favouring the intervention.

Five studies reporting on anthropometry (trends in overweight and obesity) were included in **Fig. 5**. Of the studies (all on nutrition standards or rules for food), two found a clear effect favouring the intervention (one involved a 10% reduction in the energy content of pre-primary school meals and the other a decreasing trend in the BMI z-scores), whereas the other three studies found no difference in effect.

Outcomes related to attitudes towards food were reported by one study. The study reported no difference in effect for both behaviours related to healthy dietary habits and attitudes towards foods.

One study reported on portion sizes served (grams of vegetables provided per day); it reported an unclear effect potentially favouring nutrition standards.

Nudging interventions promoting healthy food behaviour in the school environment

A total of 33 studies on nudging interventions promoting healthy food behaviours in the school environment were included in the systematic review ($n = 23$) and rapid review update ($n = 10$). These assessed interventions that changed how food was presented ($n = 7 + 2$) or positioned ($n = 5 + 4$); changed portion sizes ($n = 6$); improved functionality (reducing the time and effort costs of eating breakfast by moving the meals from cafeterias to classrooms) ($n = 1$); involved multiple nudging strategies ($n = 7$); or provided information ($n = 1$). The specific nudging interventions varied widely (**Box 1**).

Fig. 6 shows the effects of nudging interventions on the five critical outcomes for which evidence was available. For the outcome of dietary intake, studies were only included in **Fig. 6** if they reported energy intake; energy intake was prioritized over other dietary intake measures as the most relevant measure.

Fifteen studies reporting on consumption of foods that contribute to a healthy diet were included in **Fig. 6**. Five studies (three of presentation, one of portion sizes and one of positioning) clearly favoured the intervention, two (one of positioning and one of multiple strategies) potentially favoured the intervention, seven (three of presentation, two of positioning and two of multiple strategies) reported no difference in effect and one (of positioning) reported an unclear effect potentially favouring the control.

Two studies reporting on consumption of foods that do not contribute to a healthy diet were included in **Fig. 6**. Of these two trials (of positioning), one found no difference in effect and the other an unclear effect potentially favouring the intervention.

Nine studies reporting on energy intake were included in **Fig. 6**. Four studies (two of presentation, one of portion sizes and one of multiple strategies) found no difference in effect. Three studies that examined the effect of serving larger portion sizes reported a clear effect favouring the control, with increased energy intake with larger portion sizes (the intervention). One study that examined the effect of using larger dishware reported an unclear effect potentially favouring the control, with increased energy intake with larger dishware (the intervention). One study (of multiple strategies) clearly favoured the intervention.

Box 1. Examples of nudging interventions included in the systematic review

Changes to presentation:

- increasing the visibility of plain milk compared with that of chocolate milk;
- serving fruit cut up rather than whole;
- increasing the attractiveness of fruit and vegetables (e.g. with stickers);
- serving healthy snacks in shapes like hearts or animals;
- serving a variety of fruit or vegetables rather than a single fruit or vegetable;
- pairing a vegetable with a well liked dish; and
- serving a two-course meal rather than a single-course meal.

Changes to positioning:

- placing plain milk on the self-service counter and chocolate milk behind the counter;
- redesigning online menus so that fruit and vegetable snack items were listed first; and
- making water more accessible by placing water coolers in cafeterias and installing waterjets (i.e. drinking fountains, water fountains or water bubblers).

Changes to portion size:

- increasing portion sizes by 50% compared with a standard portion size;
- providing a small portion size rather than a large portion size; and
- using large dishware rather than small dishware.

Changes to functionality:

- providing free breakfast in class rather than in a cafeteria before class.

Use of multiple nudging strategies:

- changing online canteens or tuckshops to encourage students to purchase healthier foods and beverages for their lunch, including labelling, product placement or other changes; and
- enhancing the visibility, location and attractiveness of fruit in the lunchroom.

Provision of information:

- labelling menu items in the school online ordering system with symbols indicating if they were "Everyday – Choose every day for healthy happy kids", "Occasional – Choose occasionally" or "Should not be sold – Caution: Consider switching".

Sixteen studies reporting on purchasing behaviour or sales data were included in **Fig. 6**. Seven (two of presentation, two of positioning, two of multiple strategies and one of information) showed a clear effect favouring the intervention, eight (three of presentation, two of positioning and three of multiple strategies) showed an unclear effect potentially favouring the intervention, and one (of positioning) reported no difference in effect.

Three studies (two of multiple strategies and one of information) reported on the nutrient and calorie content of available food. One trial reported a clear effect favouring the intervention, a second trial reported an unclear effect potentially favouring the intervention and a third trial indicated that menu labelling reduced the energy content per order at 4 weeks.

Only one study, which assessed the provision of free in-class breakfast at the beginning of the school day compared with the provision of free breakfast in the cafeteria before classes, reported on educational outcomes. It found an unclear effect potentially favouring the intervention on reading and math achievement scores.

Fig. 6 Harvest plot of the effects of nudging interventions promoting healthy food behaviour in the school environment on selected outcomes

Outcome and certainty of evidence	Clear effect favouring the control	Unclear effect potentially favouring the control	No difference	Unclear effect potentially favouring the intervention	Clear effect favouring the intervention
Consumption of foods that contribute to a healthy diet (critical outcome)					
Changes to presentation ⨁⨁◯◯			■■■		■■■
Changes to portion size ⨁⨁⨁◯					■*
Changes to positioning ⨁⨁⨁◯		■	■■**	■	■
Multiple strategies ⨁⨁⨁◯			■■	■	
Consumption of foods that do not contribute to a healthy diet (critical outcome)					
Changes to positioning ⨁⨁◯◯			■*	■*	
Diet: energy intake (critical outcome)					
Changes to presentation ⨁◯◯◯			■■		
Changes to portion size ⨁⨁◯◯	■■■*	■	■		
Multiple strategies ⨁⨁⨁◯			■		■
Purchasing behaviour or sales data (critical outcome)					
Changes to presentation ⨁⨁◯◯				■■■**	■■
Changes to positioning ⨁⨁◯◯			■	■■	■■*
Multiple strategies ⨁⨁⨁⨁				■■■	■■**
Information ⨁⨁⨁⨁					■*
Nutrient and/or calorie content of available foods (critical outcome)					
Multiple strategies ⨁⨁⨁◯				■*	■*
Information ⨁⨁⨁⨁					■*

Each block represents one study. A black box indicates randomized trials. Asterisks indicate studies from the rapid review update. Certainty of the evidence = ⨁◯◯◯ very low; ⨁⨁◯◯ low; ⨁⨁⨁◯ moderate; ⨁⨁⨁⨁ high.

Note: The grey shaded area is characterized by uncertainty regarding the effect (e.g. a RR of 1.02 with a 95% CI of 0.91–1.15 would be found under "Unclear effect potentially favouring the intervention". However, based on the 95% CI, this intervention could also be harmful). The darker grey column in the centre indicates that the 95% CI crosses the null and is narrow.

One study (of positioning) reported on attitudes towards water; it found an unclear effect potentially favouring the control on students reporting they liked the taste of water and an unclear effect potentially favouring the intervention on students reporting that tap water is safe to drink and healthy.

Behaviours related to dietary habits were reported by two new trials. Pooled analysis (**Annex 8**) indicated no difference in effect on the percentage of participants filling water bottles at school.

For clarity, for the dietary intake outcome, the three studies favouring the control found a clear effect favouring the reference portion (i.e. lower energy intake with the reference portion size) and the study potentially favouring the control found increased energy intake with larger dishware (the intervention).

3.2 Evidence on contextual factors

As part of the WHO guideline development process, contextual factors that may affect the implementation of an intervention were considered. Contextual factors included values towards the health outcomes of school food and nutrition policies and interventions; resource implications (including the costs and cost–effectiveness of interventions); equity and human rights; acceptability (reflecting the perspectives, attitudes and opinions of teachers, students and parents); and feasibility. A total of 350 publications were included in the review of contextual factors relevant to school food and nutrition policies and interventions *(68)*. The overall aim of the review of contextual factors was to search for, identify, summarize and present information on the impact of contextual factors on implementation of school food and nutrition policies interventions.

Forty-nine publications provided evidence related to values. Children generally had a good understanding of foods that contribute to a healthy diet, although feelings about healthy eating varied. Students linked healthy eating to body image, and feeling fit and energized, but foods that contribute to a healthy diet were also reported to be less filling. In several studies, students valued options and the autonomy to choose the foods they purchase and consume. Taste and appearance of foods were important factors influencing children's choices. Some studies identified peer pressure to consume foods that do not contribute to a healthy diet as an important factor influencing children's choices. There was no variability in values about diet-related NCDs, which were perceived negatively in identified studies. Values about body weight status varied by study population, but these variations were mainly based on values relating to body image and aesthetics, rather than health.

Forty-four publications provided evidence related to resource implications for direct food provision and for nutrition standards or rules that determine the quality of food served or sold in and around schools. No evidence was identified on the resource implications of nudging interventions. The cost of direct food provision varied widely and was impacted by factors such as type of school (e.g. pre-, primary or secondary; public or private), economies of scale, the type of food provided and rurality. Commodity costs were typically the largest contributor to cost; other main contributors included transportation, logistics and programme support. Costs reported in publications ranged from about US$ 20 to US$ 1500 per child per year. Globally, the average cost of providing school feeding programmes to the children most in need was estimated to be US$ 64 per child per year in 2020. In addition to the annual running costs, there are one-off costs associated with establishing or maintaining school feeding programmes (e.g. establishing or upgrading kitchen and dining facilities). The source of funding for school feeding programmes also differed, with LICs tending to rely more on external funding (e.g. donor agencies) and middle-income countries and HICs primarily funding programmes through internal revenues (e.g. taxes). Reported cost–benefit ratios for school feeding programmes varied and depended on the type of programme. One investment case model found that the cost–benefit ratio ranged from 1 : 3 to 1 : 8, meaning that the government could receive at least three dollars in economic returns for each dollar spent on school feeding programmes. For nutrition standards, some studies reported there were costs associated with ensuring that school meals aligned with existing, new or updated standards, whereas others reported no change to the food cost of meals.

With regard to human rights, no direct references to school food and nutrition policies and interventions were identified in the Universal Declaration of Human Rights; the International Covenant on Economic, Social and Cultural Rights; or the Convention on the Rights of the Child. However, the Convention on the Rights of the Child states that "institutions, services and facilities responsible for the care or protection of

children shall conform with the standards established by competent authorities, particularly in the areas of safety and health" (Article 3). Special Rapporteurs on the right to food and on the right to health have recommended the implementation of school food and nutrition policies and interventions to realize the right to health and the right to food. In some countries, school food and nutrition policies and interventions have been driven by a rights-based approach. Direct food provision appeared to reduce educational and dietary inequities and implementation of nutrition standards reduced dietary inequities in some studies.

A total of 116 publications provided evidence related to acceptability to governments, policy-makers, the public (including parents), school-based stakeholders, students and industry. Most were from HICs. Among parents and students, the acceptability of direct food provision varied. Parents' concerns reported in publications included food being too healthy or not being healthy enough, a lack of choice, unfamiliarity or dislike of food, and small portion sizes. Complaints by students related to portion size and limited options. School-based stakeholders, including teachers, principals, and catering staff, were generally supportive of direct food provision. In the single study identified on acceptability of direct food provision among policy-makers, the acceptability of expanding a free school meal programme varied greatly. The findings of studies related to food waste varied. Many studies reported that most parents supported nutrition standards or rules that determine the quality of food served or sold in and around schools. The acceptability of nutrition standards or rules appeared to be lower among students than among parents. Some studies found that acceptability increased over time. Most studies found that school-based stakeholders were supportive of nutrition standards or rules, although some believed standards or rules were too restrictive or their implementation was too burdensome. Industry was generally less supportive of nutrition standards or rules than other stakeholder groups. Of two publications identified that assessed acceptability to government stakeholders, one reported opposition to nutrition standards or rules and one reported support. Some studies reported an increase in food waste with new nutrition standards or rules. Nudging interventions were generally accepted among students and school-based stakeholders, in the presence of supportive school-level system factors (such as time and cafeteria space). Students were more supportive of less intrusive interventions, such as changing names of healthier dishes to make them more appealing. Acceptability was lower for interventions such as being informed of how their vegetable consumption compared with their peers.

One hundred and sixty-eight publications provided evidence related to feasibility. Many direct food provision programmes are in place, pointing to its feasibility. Evidence identified on feasibility showed that facilitators of the development and implementation of direct food provision included political will, local leadership, the ability to accurately predict demand for meal options, programme coordination, school community involvement, and mechanisms for collaboration and engagement with a range of stakeholders. Insufficient funds, school infrastructure (e.g. need for equipment, insufficient space to prepare and store food, and insufficient dining space), lack of supervision and staffing concerns (e.g. insufficient staff) were identified as barriers. For monitoring of direct food provision, established systems were identified as a facilitator, and a lack of investment in monitoring and failure to consider monitoring during scale-up of programmes were identified as barriers. Facilitators of the development and implementation of nutrition standards or rules included expert panels (to make recommendations to government), policy working groups and higher-level policies or mandates. Barriers to development and implementation included a lack of awareness and understanding of policy details, financial issues (including lack of financial resources, a perceived higher cost of healthy food and (mostly unfounded) arguments about reduced revenue or profits), lack of school infrastructure and facilities, lack of time and/or human resources, ethical dilemmas for catering staff (e.g. offering children different food when they did not want the food that was available to ensure they did not go hungry), industry interference and access around schools to foods that do not contribute to a healthy diet. Barriers to monitoring included unclear rules, a lack of accountability information (e.g. consequences of noncompliance) and a lack of human and financial resources. Barriers to developing and implementing nudging interventions included time constraints, lack of teacher confidence, knowledge or training, mess in class from preparation of the food and lack of available space.

4. Good-practice statement and recommendations

These recommendations apply to all schools, whether public or private; pre-, primary or secondary; and in a low-, middle- or high-income country. The recommendations in this guideline should be considered together with other WHO dietary guidelines and guidelines on food environment policies, including the WHO guideline on protecting children from the harmful impact of food marketing *(2)*.

Good-practice statement[1]

The foods and beverages provided, served, sold or consumed at schools should be safe and contribute to healthy diets.

Statement rationale

The good-practice statement was formulated by the NUGAG Subgroup on Policy Actions based on several key considerations.

- Enabling children to achieve their full developmental potential is a human right and a critical foundation for sustainable development.
- The State Parties to the Convention on the Rights of the Child have a legal obligation to ensure that children's rights are respected, protected and fulfilled, including "through the provision of adequate nutritious food and clean drinking-water" *(5)*.
- Furthermore, "in all actions concerning children, whether undertaken by public or private social welfare institutions, … the best interests of the child shall be a primary consideration" *(5)*. State Parties to the Convention on the Rights of the Child should "ensure that the institutions, services and facilities responsible for the care or protection of children shall conform with the standards established by competent authorities, particularly in the areas of … health" *(5)*.
- Schools, where many children spend a large proportion of their time, provide a unique setting for countries to respect, protect and fulfil these rights, to help children develop a positive outlook on life and to contribute to human capital development.
- Foods that contribute to a healthy diet are nutrient-dense foods rich in naturally occurring fibre and/or unsaturated fatty acids, low in saturated fatty acids, *trans*-fatty acids, free sugars and salt, free of non-sugar sweeteners, and/or the consumption of which is associated with positive health outcomes.

[1] The good-practice statement represents a recommendation that the guideline development group determined was important to be articulated and for which it considered it sufficiently obvious that the desirable effects outweigh the undesirable effects such that no direct evidence is available because no one would conduct a study to examine the issue. The good-practice statement is therefore not based on a systematic review of research evidence and does not require formal assessments of the evidence.

WHO recommendation on food provision at school

WHO recommends using food provision at school to increase consumption of foods and beverages that contribute to a healthy diet.

(Strong recommendation)

Recommendation remarks

These remarks provide context for the recommendation and are intended to facilitate interpretation and implementation.

- Food provision refers to the foods and beverages provided as meals or snacks at school, whether provided free of charge, at a reduced price or at full price, and whether provided universally (i.e. to all children) or in a targeted manner (e.g. only to children in lower socioeconomic groups).
- The foods and beverages provided as part of school food provision should contribute to a healthy diet and be in line with nutrition standards or rules set and used in schools that are based on evidence-informed dietary guidance, including food-based dietary guidelines, provided by a recognized authoritative scientific body.[1]
- The types and frequencies of foods and beverages provided, including meals, need to consider the local context, such as the nutritional situation, sociocultural considerations (including dietary customs), price and locally available food.
- To optimize the impact of school food provision on equity and school meal participation, and to reduce the risk of stigmatization linked to poverty, the local food security context and other socioeconomic determinants need to be considered. In settings where free or reduced-price food is provided in a targeted manner, strategies such as pre-order systems for food selection and cashless payment systems could be considered to reduce the risk of stigma.

Recommendation rationale

The recommendation was formulated by the NUGAG Subgroup on Policy Actions based on several key considerations (below and **Table 2**).

- Based on evidence on the effect of direct food provision in schools *(7)*, as well as the results of a rapid review update (GRADE profile 1, **Annex 8**), the group judged direct food provision in schools to have moderate desirable effects and trivial undesirable effects. The overall balance between desirable and undesirable effects was judged to probably favour the intervention. Following application of the GRADE approach (see section 2.2), the certainty of the evidence from the systematic review was considered moderate.
- The group also judged direct food provision in schools to probably be cost-effective, probably support improved health equity, probably support the realization of human rights and probably be acceptable to key stakeholders.

[1] A recognized authoritative scientific body is an organization supported by a government or competent national and/or international authorities that provides independent and transparent authoritative scientific advice (adapted from the definition provided by Codex Alimentarius *(6)*).

Table 2. Additional considerations by the NUGAG Subgroup on Policy Actions to determine the direction and strength of the recommendation on direct food provision to students in schools

Decision criteria and judgement	Additional considerations
Magnitude of desirable effects of implementing direct food provision: moderate	The group judged the magnitude of the desirable effects to be moderate but noted that the effects will also be impacted by the available resources, and the location and size of the school.
Magnitude of undesirable effects of implementing direct food provision: trivial	In the context of preventing or reducing overweight and obesity, the group noted the potential for fruit and vegetable provision to increase energy intake if the fruit and/or vegetables are consumed in addition to children's existing diets. The group noted that this highlighted the importance of considering fruit and vegetable provision in the context of all school food provision. In the systematic review, one study of fruit and vegetable provision reported a slight increase in BMI, and another study of fruit and vegetable provision reported a small but non-significant increase in energy intake. Nutrition standards or rules that limit the availability of foods that do not contribute to a healthy diet would help to mitigate potential undesirable effects of direct food provision.
Balance of desirable and undesirable effects: probably favours the intervention	The group noted that the available evidence was mainly from HICs. Based on the available evidence and country experience, the balance of desirable and undesirable effects was judged to probably favour the intervention.
Overall certainty of evidence: moderate	According to the *WHO handbook for guideline development*, if there is higher certainty of evidence for some critical outcomes to support a decision, then guideline development groups need not rate down the overall certainty of evidence because of lower confidence in estimates of effects on other critical outcomes that support the same recommendation. Across fruit and vegetable provision, and milk provision, the certainty of the evidence for four out of the six critical outcomes for which there was evidence available was rated moderate.
Cost–effectiveness: probably favours the intervention	Cost–effectiveness may vary and depends on the same factors that may affect costs (see "Resources required" below). School food provision may have other benefits, such as improved school attendance, the establishment of overall healthy eating habits and the promotion of a culture of local food.
Resources required: moderate costs	The costs considered should be costs to government. Costs will vary and depend on a range of factors, including a country's income level, the geographical location of schools (the costs for rural schools may be higher than those for urban schools), the size of schools (larger schools may benefit from economies of scale), the existing infrastructure in schools, and details of the programme and foods provided (e.g. if breakfast and/or lunch and/or snacks are provided).
Impact of implementation of direct food provision on equity: probably increased	Evidence suggested that school food provision may increase health equity. There may be a risk of stigma associated with receiving free or reduced-price food that is provided in a targeted manner. Providing free or reduced-price food universally may reduce this risk. When free or reduced-price food is provided in a targeted manner, strategies such as pre-order systems for food selection and cashless payment systems should be considered to reduce the risk of stigma. School food provision can also be an important social protection tool and may act as an incentive to keep children in school.

Decision criteria and judgement	Additional considerations
Impact of implementation of direct food provision on human rights: probably increased	Special Rapporteurs on the right to food and the right to health have recommended the implementation of school food and nutrition policies and interventions to realize the right to food and the right to health.
People's values related to the outcomes of implementation of direct food provision: possibly important uncertainty or variability	The group noted that although values are important, they need to be considered alongside other relevant factors, such as general support for school food and nutrition policies and interventions.
Acceptability of direct food provision to key actors: probably yes	Among parents and students, the acceptability of food provision varies. Parents and students' concerns include limited options and a lack of choice; ensuring there are a range of options may therefore increase acceptability among parents and students. School-based stakeholders, including teachers, principals and catering staff, are generally supportive of direct food provision. The review of contextual factors did not identify any publications that specifically looked at acceptability of food provision among industry stakeholders.
Feasibility of implementing direct food provision: probably yes	The existence of school food provision programmes (in both LICs and HICs) points to their feasibility. Such programmes have also been implemented in conflict and emergency situations. The feasibility of implementing school food provision programmes may be lower in LICs.

WHO recommendation on nutrition standards or rules

WHO recommends setting and using nutrition standards or rules to increase the availability, purchase and consumption at school of foods and beverages that contribute to a healthy diet and to decrease the availability, purchase and consumption at schools of foods and beverages that do not contribute to a healthy diet.

(Strong recommendation)

Recommendation remarks

These remarks provide context for the recommendation and are intended to facilitate interpretation and implementation.

- Nutrition standards or rules specify which foods and beverages are and are not allowed to be provided, served or sold at schools. They include nutrition standards based on nutrient- or food-based criteria and criteria related to food preparation methods or how food is served.
- The development of nutrition standards or rules should be based on evidence-informed dietary guidance provided by a recognized authoritative scientific body, considering the local context, including the nutritional situation, sociocultural considerations (including dietary customs), prices and locally available food.
- Nutrition standards or rules may also be implemented through mandatory legal instruments to regulate food environments around schools, extending their impact beyond the school premises.

Recommendation rationale

The recommendation was formulated by the NUGAG Subgroup on Policy Actions based on several key considerations (below and **Table 3**).

- Based on evidence on the effect of nutrition standards or rules that determine the quality of foods and beverages served or sold in schools *(7)* as well as a rapid review update (GRADE profile 2, **Annex 8**), the group judged nutrition standards or rules to have small desirable effects and trivial undesirable effects. Overall, the group judged the balance between desirable and undesirable effects to favour the intervention. Following application of the GRADE approach (see section 2.2), the certainty of the evidence from the systematic review and the rapid review update was considered low.
- The group also judged nutrition standards or rules to probably be cost-effective, probably support improved health equity and probably support the realization of human rights.

Table 3. Additional considerations by the NUGAG Subgroup on Policy Actions to determine the direction and strength of the recommendation on nutrition standards or rules that determine the quality of food served or sold in and around schools

Decision criteria and judgement	Additional considerations
Magnitude of desirable effects of implementing nutrition standards or rules: small	The interventions included in the systematic review on the effectiveness of policies and interventions that influence the school food environment varied (e.g. some involved nutrition standards or rules for school meals whereas others involved nutrition standards or rules for vending machines). The evidence from the rapid review update confirmed the results of the systematic review, and provided new evidence of a desirable effect. The group judged the magnitude of the desirable effects of implementing nutrition standards or rules, compared with not implementing standards or rules, to be small and consistently favouring the intervention. The observed effects were mainly based on evidence from HICs, but the group considered it unlikely that the effects would be substantially different in LICs.
Magnitude of undesirable effects of implementing nutrition standards or rules: trivial	The group judged the undesirable effects to be trivial. None of the included studies showed adverse or undesirable effects. Some showed no difference in effect.
Balance of desirable and undesirable effects: favours the intervention	The group judged the desirable effects to be small, but to clearly outweigh the undesirable effects. The evidence consistently favoured the intervention, and the observed small effects could have potentially significant effects at the population level. Nutrition standards or rules can catalyse positive changes in the availability, purchase and consumption of foods and beverages at school, with a very low risk of harm.
Overall certainty of evidence: low	For most of the critical outcomes for which there was evidence available, all the studies were observational studies, leading to a lower certainty of evidence when applying the GRADE system. The included RCTs were most often downgraded for imprecision, due to small sample sizes and large CIs.
Cost–effectiveness: probably favours the intervention	No direct evidence was identified on the cost–effectiveness of nutrition standards.
Resources required: moderate costs	The group noted costs considered should be costs to government and not to other actors (e.g. industry). There are different resource implications for HICs and LICs. The cost of meals and school food funding both vary by country. The group noted that the costs will depend on the current situation regarding nutrition standards or rules in a country (i.e. how much change is required from the current situation). Both the set-up costs and running costs of implementing nutrition standards or rules should be considered. The group noted that studies included in the review of contextual factors reported the costs in different ways (e.g. per student or across an entire state), which made comparing the costs challenging.

Decision criteria and judgement	Additional considerations
Impact of implementation of nutrition standards or rules on equity: probably increased	The group noted that some schools may face more barriers to implementing nutrition standards or rules than others (e.g. disadvantaged schools may have more difficulties obtaining funding) but noted that the judgement for this decision criteria should reflect the impact of the intervention itself on health equity. If nutrition standards are implemented as intended, the group noted that they should have a universal effect (i.e. they should increase the availability of healthy food for all students).
Impact of implementation of nutrition standards or rules on human rights: probably increased	The group noted the likely impact of policies on human rights. The group's judgement considered that Special Rapporteurs on the right to food and the right to health have recommended the implementation of school food and nutrition policies and interventions to realize the right to food and the right to health.
People's values related to the outcomes of implementation of nutrition standards or rules: possibly important uncertainty or variability	The group noted that although values are important, they need to be considered alongside other relevant factors, such as general support for school food and nutrition policies and interventions.
Acceptability of nutrition standards or rules to key actors: varies	The group noted that the existence of nutrition standards or rules in many countries shows the acceptability of such policies. Acceptability varies between, and within, stakeholder groups, including government, policy-makers, the public and industry. The group noted that industry is not homogenous, and there is variability between different industry stakeholders (e.g. between small, local fruit and vegetable markets and large food and beverage manufacturers). The group also noted that the industry response may vary depending on the content and scope of the nutrition standards.
Feasibility of implementing nutrition standards or rules: probably yes	The group noted that the existence of nutrition standards or rules in many countries shows the feasibility of such policies. The facilitators of and barriers to implementation may differ depending on the procurement model used (e.g. centralized, decentralized or mixed). There may be initial opposition and perceived infeasibility by industry.

WHO recommendation on nudging interventions

WHO suggests implementing nudging interventions that modify the food environment at school to increase selection, purchase and consumption of foods and beverages that contribute to a healthy diet, particularly when multiple nudging interventions are implemented.

(Conditional recommendation)

Recommendation remarks

These remarks provide context for the recommendation and are intended to facilitate interpretation and implementation.

- Nudging interventions in schools deliberately adjust the choice architecture and the context within which decisions are made. Food choice architecture relates to the various ways food options are framed to promote or demote the selection of certain food options and the subsequent influence these have on children's selections. Nudging interventions do not forbid any option or significantly change economic incentives, and they can only be implemented if healthier options are available.
- Nudging interventions change the choice architecture within which children choose from the foods available in schools. Nudging interventions can be considered as part of a comprehensive package of

school food and nutrition policies and interventions but should not be implemented as an alternative to ensuring the provision of foods that contribute to a healthy diet and implementing nutrition standards.

- Nudging interventions can include, but are not limited to, changes in how foods are presented, positioned or provided (including changes to portion sizes), and the provision of nutrition information about food.
- The effectiveness of implementation of individual nudging interventions varies depending on the type of nudge. Some interventions, such as changes to how food is presented, tend to be more effective whereas others, such as changes to how food is positioned, may have less impact. The implementation of multiple nudging interventions within a single setting is likely to be favourable in increasing the selection, purchase and consumption of foods that contribute to a healthy diet.

Recommendation rationale

The recommendation was formulated by the NUGAG Subgroup on Policy Actions based on several key considerations (below and **Table 4**).

Based on evidence on the effect of nudging interventions promoting healthy food behaviour in the school environment *(7)* as well as a rapid review update (GRADE profile 3, **Annex 8**), the group judged nudging interventions to have trivial undesirable effects. The overall balance between desirable and undesirable effects was judged to probably favour the intervention, but nudging interventions can only be implemented if healthier options are available. Following application of the GRADE approach (see section 2.2), the overall certainty of the evidence from the systematic review and rapid review update was considered low to moderate.

The group also judged nudging interventions to probably support improved health equity and probably be acceptable to key stakeholders.

Table 4. Additional considerations by the NUGAG Subgroup on Policy Actions to determine the direction and strength of the recommendation on nudging interventions promoting healthy food behaviour in the school environment

Decision criteria and judgement	Additional considerations
Magnitude of desirable effects of implementing nudging interventions: varies	Nudging interventions are evolving rapidly. The group noted that the interventions included in both the systematic review and the rapid review update varied in design and scope, and had varying degrees of effectiveness. The evidence suggested that some interventions, such as changes to food positioning were less effective, whereas others such as changes to food presentation and implementation of multiple nudging strategies were more likely to have positive outcomes. Nudging interventions can only be implemented when healthier options are available.
Magnitude of undesirable effects of implementing nudging interventions: trivial	The group judged the undesirable effects to be trivial. None of the studies included showed adverse or undesirable effects.
Balance of desirable and undesirable effects: probably favours the intervention	The group judged the desirable effects to outweigh the undesirable effects.
Overall certainty of evidence: low to moderate	The group judged the overall certainty of evidence for all nudging interventions to be low to moderate for all outcomes. The certainty of evidence was judged to be very low to low for nudging interventions that changed food presentation and low to moderate for nudging interventions that changed food positioning. In contrast, the certainty of evidence for nudging interventions that used multiple strategies was judged to be moderate to high.

Decision criteria and judgement	Additional considerations
Cost–effectiveness: no included studies	The group chose not to make a judgement on the cost–effectiveness of nudging interventions, as the review of contextual factors did not identify any studies that specifically looked at this.
Resources required: negligible costs	The review of contextual factors did not identify any studies that specifically looked at the resource implications of nudging interventions. The group noted that some nudging interventions (e.g. changing the positioning of food) are likely to have no or low costs.
Impact of implementation of nudging interventions on equity: probably increased	The review of contextual factors did not identify any studies that specifically looked at the equity implications of nudging interventions. The group noted that some nudging interventions, in theory, might increase equity (i.e. reduce inequity) by making healthier choices easier.
Impact of implementation of nudging interventions on human rights: probably no impact	The review of contextual factors did not identify any studies that specifically looked at the human rights implications of nudging interventions.
People's values related to the outcomes of implementation of nudging interventions: possibly important uncertainty or variability	The group noted that although values are important, they need to be considered alongside other relevant factors, such as general support for school food and nutrition policies and interventions.
Acceptability of nudging interventions to key actors: probably yes	Evidence from the review of contextual factors suggested that students and school-based stakeholders were generally supportive of nudging interventions. The review of contextual factors did not identify any studies that specifically looked at acceptability of nudging interventions among industry stakeholders.
Feasibility of implementing nudging interventions: probably yes	Evidence from the review of contextual factors suggested that implementation of nudging interventions is feasible but also that the barriers to implementation vary for different interventions (e.g. some interventions may be more time-consuming to implement than others).

5. Implementation considerations

This chapter is not intended to provide an exhaustive list of implementation considerations. Instead, it aims to highlight some key considerations for implementing the recommendations in this guideline. These considerations:

- emerged from the evidence reviews that informed this guideline *(7, 68)*;
- were discussed by the NUGAG Subgroup on Policy Actions and contributors to the guideline development process; and/or
- come from existing implementation resources, including those on health-promoting schools more broadly and those that are specifically food and nutrition–related, such as WHO's *Action framework for developing and implementing public food procurement and service policies for a healthy diet (72)* and policy brief on nudges to promote healthy eating in school *(4)*.

In general, the NUGAG Subgroup on Policy Actions emphasized that implementation of the recommendations in this guideline must be tailored to the country context. This includes consideration of the country's:

- nutritional situation, reflecting national and local nutritional priorities, and whether undernutrition, micronutrient deficiencies, overweight or obesity need addressing – needs assessments and baseline surveys can help to identify specific issues to target;
- sociocultural and socioeconomic context, as food practices are deeply embedded in cultural traditions, social norms and economic realities – the recommendations must respect cultural dietary customs while promoting healthier decisions, and be sensitive to socioeconomic differences that may affect access to healthy foods;
- locally available food and climate vulnerabilities, as using locally available, seasonal foods supports sustainability, reduces costs and strengthens community ties – implementation must also consider climate change and food security vulnerabilities to ensure that food provision models are resilient to environmental shocks;
- available resources, infrastructure and capacities, as infrastructure (such as water and sanitation systems, food distribution and transportation systems, kitchens and storage facilities) and human resources significantly influence the feasibility of different interventions – assessing existing capacities and addressing critical gaps are essential first steps;
- existing governance structures, including mechanisms for oversight and enforcement, which should be leveraged or strengthened – mechanisms to identify and manage conflicts of interest must be put in place to protect public health objectives, particularly when engaging with the private sector;
- policy context, including existing policy and legal frameworks related to food (including food procurement), nutrition, education, agriculture and public health;
- political economy, including potential enablers and barriers to regulatory action; and
- stakeholders with an interest in the policy outcome and whether, or at what stage, they may be engaged in the policy process to optimize policy effectiveness and implementation while protecting public health objectives.

The global framework developed by WHO and UNESCO for making every school a health-promoting school *(73)* provides a foundational whole-of-school approach for implementing the guideline's recommendations,

alongside other elements that make up a nutrition-friendly school, including awareness and capacity-building of the school community, a nutrition and health–promoting curriculum, and supportive school nutrition and health services *(54)*.

The recommendations in this guideline should be integrated across the school governance, environment and curriculum, and in community engagement activities. Strong community engagement fosters ownership, supports behaviour change and contributes to sustainability. Leadership commitment at multiple levels – from school principals to district education authorities – is a critical facilitator. Community engagement and leadership commitment beyond the school community can not only support the implementation of school nutrition standards or rules, but can also support and promote the use of mandatory legal instruments to shape and regulate food environments surrounding schools, extending their impact beyond the school premises.

The buy-in of the school community, including the school principal, teachers, students, parents and food service staff, is essential for successful and sustained implementation. Participatory approaches such as establishing school food committees, involving students in menu design and consulting parents increase local ownership and relevance. Meaningful and sustained engagement of the entire school community – including leadership, teachers, staff, students, families and community organizations – is a cornerstone of successful implementation.

Strategies to engage the whole school community include:

- establishing participatory school food committees involving students, parents and staff;
- establishing school health committees or similar bodies to ensure sustained oversight, resource mobilization and accountability for implementation of the recommendations;
- providing training and capacity-building for school staff (school leadership, teachers, administrators, food service personnel and other relevant workers) to implement new standards and practices effectively – training should cover the rationale behind interventions, specific skills (e.g. healthy food preparation and marketing of healthy choices), and mechanisms for monitoring and evaluation, and can build confidence, foster enthusiasm and reduce resistance to change;
- empowering students as nutrition champions who advocate for healthy food choices; and
- organizing schoolwide activities and campaigns to promote healthy eating in a fun and culturally relevant way.

Implementation of school-based interventions requires coordinated multisectoral efforts. Ministries of education, health, agriculture, finance and social protection, as well as local governments and community organizations, should be involved in the design, delivery and monitoring of interventions. At a higher level, establishing multisectoral governance bodies, such as interministerial committees or school health platforms, helps to align efforts and optimize resources.

Strong governance measures are critical, particularly given the involvement of multiple stakeholders, including food vendors and service providers who may have vested or conflicting interests. Transparent engagement processes, declarations of interest, due diligence reviews and public disclosure of stakeholder input can help to protect the integrity of policies. Food industry actors that produce or promote unhealthy foods and beverages may seek to collaborate with schools under the guise of partnerships or sponsorships. Such arrangements can be used as a marketing strategy to promote brand loyalty among children, often undermining public health goals. It is therefore important to critically assess all proposed collaborations, recognize sponsorship as a form of marketing and consider prohibiting all forms of food and beverage marketing in schools, in line with the WHO guideline on policies to protect children from the harmful impact of food marketing *(2)*.

Robust monitoring, evaluation and enforcement systems are critical for the successful implementation of school food and nutrition interventions. However, as highlighted in UNESCO's *Ready to learn and thrive: school health and nutrition around the world (74)*, monitoring and evaluation often receive limited attention in practice. This gap undermines the effectiveness, accountability and sustainability of school nutrition policies. Many countries lack clear frameworks, standardized indicators and allocated resources

to systematically track compliance with nutrition standards, the quality of food provision or nutritional outcomes among students.

To overcome this challenge, monitoring and evaluation should be planned for and have a budget earmarked for it at the beginning of the policy process. A clear programme coordination mechanism should be defined and led by the responsible ministry. This mechanism should include aspects such as integration of monitoring, and training on monitoring, which will overcome barriers such as lack of accountability or unclear rules. Monitoring of school food provision should cover multiple dimensions, including:

- compliance with procurement policies and nutrition standards;
- changes in the school food environment and changes to available foods;
- food purchasing and consumption patterns among students; and
- health and nutrition outcomes, including undernutrition, micronutrient deficiencies, overweight and obesity.

The outcomes of the intervention should be communicated to partners and key stakeholders to demonstrate progress and amplify successes.

Monitoring and reporting of compliance with safe and healthy food provision can be supported by digital technology, aiding programme evaluation and reporting. WHO's *Action framework for developing and implementing public food procurement and service policies for a healthy diet (72)* provides proposed indicators and detail on where to monitor, what to monitor, and how to monitor and report violations.

When implementing the recommendations in this guideline, it is essential to consider other relevant guidance, including from partner organizations, to ensure a coordinated approach to promoting healthy eating habits, improving nutrition and enhancing the well-being of children (see section 5.5).

5.1 Considerations for food provision

Depending on the country-specific considerations outlined above, the purpose and scope of food provision will vary – it can include the provision of meals or of selected foods (e.g. vegetables and fruit).

Any food provision at school, however, requires careful planning of food procurement, preparation and distribution systems. WHO's *Action framework for developing and implementing public food procurement and service policies for a healthy diet (72)* can be a good starting point when developing and implementing school food provision. The action framework offers useful guidance for four main policy stages: policy preparation; policy development; policy implementation; and monitoring, enforcement and evaluation. It suggests guiding principles for healthy public procurement and service policies to ensure that policies are based on evidence and human rights, safeguard public health interest, apply a health in all policies approach and ensure policy coherence.

Advocacy and communication are essential to gain early political buy-in, mobilize broader support and mitigate potential opposition. The lead government institution should prepare a clear, evidence-based case for food provision, demonstrating both the health and social benefits. Proactive communication strategies and engagement of the school community from the beginning can help to address anticipated concerns, reinforce the value of healthier school environments, and engage the school community meaningfully from the start to help to build consensus. Possible concerns from food vendors, such as revenue loss, or concerns from parents about food options or portion sizes should be anticipated early.

Resource planning is crucial. The resources required for school food provision vary depending on factors such as the scale and scope of the programme, the geographical area, economies of scale, the type of food provided, and whether schools are in urban or rural areas *(68)*. Additionally, funding arrangements and the procurement model – whether centralized, decentralized or mixed – play a critical role. Although the cost of food is a main driver of the overall expense of food provision, other factors such as handling, storage and transportation also contribute to the total cost *(68)*. Schools with high rates of participation in school meal programmes may benefit from lower costs per meal due to economies of scale, making it more feasible to provide nutritious options for all students *(68)*.

Costs associated with school food provision can include one-off set-up costs (e.g. establishing or upgrading kitchen and dining facilities), ongoing operating costs (e.g. payments for cooks and canteen or tuckshop workers) and food procurement costs. Funding sources for school feeding programmes may vary significantly by country. In middle-income countries and HICs, school feeding programmes are primarily funded through internal revenue (e.g. taxes) whereas programmes in LICs tend to rely more on external funding (e.g. donor agencies) (the percentage of funds from external donors in LICs has decreased in recent years while the share of domestic funding has increased *(68)*). As school food and nutrition policies and interventions are relevant to multiple sectors (e.g. education, health and nutrition, social protection, agriculture and gender equality), costs may be borne by the national budget rather than the education sector alone, as is the case in some countries *(68)*.

Potential strategies to reduce the cost of food provision include:

- planning food purchasing considering what might work best in the local context (e.g. purchasing locally, or directly from local farmers cooperatives or community supported agriculture schemes to reduce transportation costs and/or purchasing in bulk to increase purchasing power);
- balancing changes that increase costs with changes that reduce costs (e.g. reducing portion sizes of meat and/or serving water instead of juice or other sugar-sweetened beverages);
- pooling purchasing across schools or districts to leverage economies of scale;
- reducing food waste through staff training and student education;
- using seasonal menu planning that aligns menus with local harvests;

Partnerships with the agricultural sector are important when food provision involves sourcing food from local producers. Such collaborations can improve the nutritional quality of food provided at school, foster community development and promote local economies. The Home-Grown School Feeding Programme provides an example of linking school feeding programmes with small-scale farmers *(75)*.

School food procurement decisions also have significant implications for environmental outcomes such as greenhouse gas emissions, biodiversity and local food systems. Incorporating sustainability principles – such as sourcing seasonal, locally produced foods, offering more plant-based options, and minimizing food waste – not only promotes health, but also aligns with broader climate and environmental goals *(76)*.

Several strategies have been suggested to reduce food waste in schools. These include providing opportunities for students to learn about, grow, cook and taste fruit and vegetables; making these options more convenient to eat; limiting the amount of food served at one time, particularly for new, unfamiliar or less popular items *(77)*; and ensuring that students have adequate seated time to eat *(78)*. As nutrition standards change, students may require time to adjust to new food offerings. Although initial resistance to changes resulting from new guidance is common, research has shown that students adapt well over time *(79, 80)*. A systematic review included in the review of contextual factors concluded that students were equally likely to accept food offered under revised guidelines as they were before the revision, resulting in stable plate waste over time *(81)*.

In general, provision of foods that are safe and contribute to a healthy diet to all students can reduce inequity and contribute to children's right to health and right to food *(68)*. There is a growing global movement to encourage governments to move towards providing school meals at no cost, to ensure equitable access to nutritious options without the stigma often associated with targeting free or low-cost meals to a specific group *(82)*. Many countries, and states and jurisdictions within them, are pursuing policies to provide free school meals to all students. When free or reduced-price food is provided in a targeted manner, strategies such as pre-order systems for food selection and cashless payment systems could be considered to reduce the risk of stigma and promote inclusivity in school meal programmes.

The NUGAG Subgroup on Policy Actions noted that, in the context of preventing or reducing overweight and obesity, direct food provision may lead to unintended effects, such as increased energy intake. This may occur if food (e.g. fruit and vegetables) is provided in addition to existing food options or if the provision is implemented as a standalone strategy. To mitigate these issues and ensure nutrition standards are met with nutrient-dense foods, calorie limits can be implemented into nutrition standards for school meals.

In contexts where school food programmes are aimed at reducing undernutrition, policy-makers need to ensure the programme does not inadvertently contribute to increasing overweight or obesity. The focus of such programmes should not only be on energy intake, but also on nutrient-dense foods.

5.2 Considerations for nutrition standards or rules

Nutrition standards or rules determine which foods are allowed to be provided, served or sold in schools. Such standards should align with national dietary guidelines and a country's broader public health goals. When there are no national dietary guidelines or they are incomplete, global guidelines, including those published by WHO, can be used.

Nutrition standards should serve to increase the availability of foods that contribute to a healthy diet and/or to limit or prohibit the availability of foods that do not contribute to a healthy diet.

Healthy diets need to meet four core principles, which are universal in their application, based on human biology and underpinned by evidence. To be healthy, diets need to be *(1)*:

- adequate – providing enough essential nutrients to prevent deficiencies and promote health, without excess;
- balanced – in energy intake, and energy sources (i.e. fats, carbohydrates and proteins) to promote healthy weight, growth and disease prevention;
- moderate – in consumption of foods, nutrients or other compounds associated with detrimental health effects; and
- diverse – including a wide variety of nutritious foods within and across food groups to favour nutrient adequacy and consumption of other health-promoting substances.

WHO's *Action framework for developing and implementing public food procurement and service policies for a healthy diet (72)* provides guidance on setting nutrition standards. Example guidance, in line with WHO dietary guidelines, includes:

- limiting intake of free sugars;
- shifting fat consumption away from saturated fats towards unsaturated fats and eliminating industrially produced trans-fats;
- limiting sodium consumption and ensuring that salt is iodized;
- increasing consumption of whole grains, vegetables, fruits, nuts and pulses; and
- ensuring the availability of free, safe drinking-water.

WHO and its partners are developing materials to set standards for the quality of school food; these will be available towards the end of 2025 *(83)*.

5.3 Considerations for nudging interventions

Nudging interventions in schools deliberately adjust the choice architecture, changing how stimuli and options are presented, and the context within which automatic decisions are made. Nudging interventions can be helpful in promoting healthier options to young children, who are more likely to be influenced by external stimuli when making decisions and might not have the cognitive ability and motivation to choose the healthiest option. Nudges can only be implemented if healthier options are available. They can still be applied even if a school stops providing unhealthy options and only serves healthy options, for example, following implementation of nutrition standards.

In general, nudging interventions must be adapted to the specific school environment, considering the age of students, cultural food preferences, cafeteria layouts and the resources available.

Before designing and testing nudges, qualitative and quantitative data and insights should be collected about the specific context in which they will be implemented, this includes conducting:

- a food inventory to assess what food options are available in and around the school, what the quality (nutritional value) of the options are, how accessible and acceptable the options are, and how they are promoted;
- a mapping of the points of access to foods – the presence of a canteen or tuckshop, external vendors or vending machines, for example, will impact which food options are available;
- an assessment of available infrastructure to prepare, store and present a variety of food options; and
- a mapping of key actors or stakeholders and their role, including the choice architect or influencers that might support or be against the promotion of healthier options for any reason –the choice architect is the stakeholder who decides what is presented and how (e.g. a school principal, or the manager of a canteen or tuckshop) whereas other influencers could be parents, students or the private sector.

These insights can be collected using a variety of methods and can then be used to determine which nudge intervention is most suitable.

Simple, low-cost nudges (such as rearranging food displays) may be more feasible in low-resource settings whereas schools with greater capacity may implement more sophisticated, or multiple, changes. Generally, nudges are low-cost interventions that modify the choice architecture using resources and set-ups that are already available. The rapid review update found that implementation of multiple nudging strategies was more likely to yield positive outcomes. Therefore, implementation should consider how multiple nudges can be used together synergistically. Before being adopted in a school environment, nudges should be pilot tested for feasibility and effects.

The pilot testing of nudges involves defining relevant indicators in the design phase. For example, sales data from a vending machine or canteen or tuckshop can be an inexpensive and objective way of measuring the quantitative impact of an intervention, if these data are being routinely collected, the owner of the data is supportive of the intervention and there is data on available stocks. However, monitoring increased consumption of tap water at water fountains will require a different evaluation strategy (using, for example, water flow meters).

Involving school leadership, food service staff and students in the design and rollout of nudging strategies increases buy-in, practicality and sustainability. Staff training is essential to ensure cafeteria workers and teachers understand the purpose of the interventions and actively support them.

Nudges should be evaluated before rollout (at baseline), immediately at the end of a pilot and over time to assess their effectiveness, acceptability and sustainability. Feedback from students and staff should guide adjustments. Schools must be prepared to refine or replace strategies that are ineffective or poorly received or which have resulted in unintended negative consequences. Clear guidelines and oversight can safeguard the integrity of interventions.

WHO's policy brief on nudges to promote healthy eating in schools provides guidance on the five steps involved in developing and implementing nudges for healthy eating in schools.

1. Investigate the prevailing choice architecture.
2. Specify the food options and the beverages to be targeted with the nudge-based intervention.
3. Establish a shortlist of nudges and select the final nudges to be implemented.
4. Implement the nudges.
5. Monitor to check fidelity, impact and sustainability *(4)*.

5.4 Considerations for multicomponent interventions

Although this guideline focuses on the individual interventions included in the systematic review that informed the guideline's development (i.e. food provision, nutrition standards and nudging interventions in schools), schools can implement interventions with multiple components. For example, schools may implement nutrition standards for school meals at the same time as incorporating environmental nudges to

encourage children to make healthier and more sustainable choices. A recent systematic review of 51 cRCTs of school-aged children from multiple countries ranked multicomponent interventions as being most effective for reducing BMI and reducing fat intake *(84)*. These interventions were also ranked highly for their effectiveness in increasing fruit and vegetable intake among students. Although multicomponent school nutrition interventions have shown promise, and the WHO Commission on Ending Childhood Obesity called for implementation of comprehensive interventions in schools, more research is needed to examine the effectiveness of individual interventions or combinations within multicomponent initiatives. Such research could be used to maximize the synergies between various components for effective programme design and implementation. Countries designing multicomponent nutrition interventions in schools should ensure they engage stakeholders with the necessary expertise and experience related to the various components being implemented.

5.5 Additional resources

Additional guidance is available when considering implementation of the recommended interventions. Selected existing global implementation resources are listed in **Box 2**. Given school food and nutrition policies and interventions may form part of a health-promoting schools approach, **Box 2** also provides selected implementation resources relevant to health-promoting schools.

Box 2. Additional resources for development and implementation of school food and nutrition policies and interventions

WHO resources

Action framework for developing and implementing public food procurement and service policies for a healthy diet (72)

Implementing school food and nutrition policies: a review of contextual factors (68)

Making every school a health-promoting school: global standards and indicators (35)

Making every school a health-promoting school: implementation guidance (73)

Making every school a health-promoting school: country case studies (85)

Nudges to promote healthy eating in schools: policy brief (4)

Nutrition action in schools: a review of the evidence related to the Nutrition-Friendly Schools Initiative (54)

Tackling NCDs: best buys and other recommended interventions for the prevention and control of noncommunicable diseases, 2nd edition (86)

Five keys to safer food manual (87)

Fiscal policies to promote healthy diets: WHO guideline (61)

Policies to protect children from the harmful impact of food marketing: WHO guideline (2)

WHO guideline: use of multiple micronutrient powders for point-of-use fortification of foods consumed by infants and young children aged 6–23 months and children aged 2–12 years (88)

Guideline: sodium intake for adults and children (89)

Guideline: sugars intake for adults and children (90)

Total fat intake for the prevention of unhealthy weight gain in adults and children: WHO guideline (91)

Saturated fatty acid and trans-fatty acid intake for adults and children: WHO guideline (92)

Carbohydrate intake for adults and children: WHO guideline (93)

Use of non-sugar sweeteners: WHO guideline (3)

Use of lower-sodium salt substitutes: WHO guideline (94)

Partner resources

FAO's *Public food procurement for sustainable food systems and healthy diets, volume 1 (95)*

FAO's *Home-grown school feeding resource framework (96)*

FAO's *Legal guide on school food and nutrition: legislating for a healthy school food environment (53)*

FAO and WHO's *Food safety is everyone's business in schools and daycare centres (97)*

WFP's *State of school feeding worldwide (98)*

WFP and the United Nations High Commissioner for Refugees' (UNHCR's) *Considerations for programming school feeding programmes in refugee settings (99)*

UNESCO's *Ready to learn and thrive: school health and nutrition around the world (74)*

6. Research gaps

Based on the results of the systematic review, rapid review update, the review of contextual factors, the discussions of the NUGAG Subgroup on Policy Actions and input received during peer review, a number of research gaps and considerations were identified. Addressing these gaps will be important when updating this guideline, and for further advocacy and action to implement school food and nutrition policies and interventions.

6.1 Overarching research gaps

Overall, most of the research informing this guideline was conducted in HICs. To improve the representativeness of the evidence, more high-quality studies conducted in LMICs are needed. Such research would provide additional information about the contextual factors that may affect the implementation of school food and nutrition policies and interventions.

Most studies included in the systematic review that took place in LMICs examined school food provision that aimed to prevent undernutrition. However, as childhood overweight and obesity rates rise in LMICs, future research should also evaluate the effectiveness of school food and nutrition policies and interventions for the promotion of healthy diets and prevention of overweight and obesity. This additional evidence will be needed to inform updates to this guideline. For both HICs and LMICs, there were no data identified for direct food provision in boarding institutions; as such, the boarding institution context has not been included in this guideline.

Given the increasing importance of consideration of sustainable food systems, more research is needed to define criteria for healthy, safe and sustainable foods.

Effectiveness of policies

The systematic review and rapid review update did not find any studies that met the eligibility criteria for two of the interventions: marketing restrictions on foods that do not contribute to a healthy diet in and around schools, and pricing policies to promote foods that contribute to a healthy diet. High-quality studies of these two interventions are needed to inform updates of this guideline.

Furthermore, none of the studies included in the systematic review and rapid review update reported on the outcome of exposure to food marketing. The evidence on the harmful impact of food marketing on children is unequivocal, and there are recommendations to protect children from this harmful impact *(2)*. Research on food marketing regulations in and around schools would strengthen the call for urgent action to protect children from marketing, including in school settings.

Contextual factors

Most of the evidence in the review of contextual factors related to food provision and nutrition standards or rules that determine the quality of food served or sold in and around schools *(68)*. No information was identified about the resource use or cost–effectiveness of nudging interventions, marketing restrictions in and around schools or pricing policies aimed at promoting healthier foods *(68)*. Likewise, no information was identified about the impact of nudging interventions, marketing restrictions or pricing policies on health equity and equality *(68)*. Furthermore, limited evidence was identified about the acceptability of nudging interventions, marketing restrictions or pricing policies to the public, parents, students, school staff and industry, or about their environmental acceptability (e.g. their impact on greenhouse gas emissions, food

waste or food packaging) *(68)*. For feasibility, no information was identified about elements that support or hinder the implementation of pricing policies in schools, indicating a significant gap in understanding the feasibility of such measures *(68)*.

Research was also limited on the political economy in the school food environment. Research on how different actors (e.g. food industry, education authorities, agriculture ministries and parents' associations) influence policy development, adoption and implementation could strengthen implementation considerations. In particular, how the vested interests of unhealthy food industries shape, delay or dilute nutrition policies – especially through lobbying, sponsorships and public–private partnerships – needs to be better documented.

6.2 Considerations for the design of future evaluations

The systematic review on the effectiveness of policies or interventions that influence the school food environment *(7)* found that the certainty of evidence (based on the GRADE approach – see section 2.2) for many outcomes of interest was low or very low. This was often due to a serious risk of bias in the included studies or significant imprecision. In future studies, the certainty of evidence could be improved by addressing common issues related to bias. For example, for RCTs, there should be transparent reporting of how randomization sequences were generated. Downgrading for imprecision often stemmed from small sample sizes and wide CIs, suggesting the need for larger, more precise studies.

The substantial heterogeneity among the interventions, comparisons and outcome measures reported made meta-analysis impractical for this review *(7)*. As a result, the primary approach to synthesis was vote counting based on the direction of effects, which limited the ability to draw conclusions about mean effect sizes for most outcomes *(7)*. As more studies become available, future systematic reviews may be able to include meta-analysis to provide a clearer demonstration of the effects of interventions.

Future studies should also ensure that the intervention duration and follow-up periods are long enough to address initial implementation challenges and observe measurable effects on the outcomes of interest. In the included studies, follow-up periods ranged from one day to eight years *(7)*; the shorter durations are unlikely to be long enough to capture effects on more distal outcomes such as educational outcomes and obesity.

Because preschoolers, primary school students and secondary school students differ in physical development, nutritional requirements and food preferences, further research will be valuable for developing age-specific recommendations, especially in the context of undernutrition, and for evaluating return on investments. Tailoring interventions to the unique needs and preferences of each group will help to ensure that policies and programmes are effective across different stages of child development and are more likely to be accepted by children.

Implementation of complex interventions remains a challenge, and implementation research may help to fill research gaps. Implementation research investigates the factors that influence how new policies or interventions are implemented in real-life settings. Conducting studies using robust designs can provide valuable insights into barriers, bottlenecks and factors that enable success. For example, the WHO Regional Office for Europe is supporting pilot projects on implementation research in Kyrgyzstan and Uzbekistan to improve uptake and implementation of effective and cost-efficient school food and nutrition policies and interventions (100). This type of study can help to refine and optimize strategies for scaling up effective interventions in diverse settings.

As mentioned previously, research in LMICs and LICs was limited, and greater attention needs to be paid to generating evidence on school meals in contexts with a high prevalence of undernutrition.

7. Uptake, monitoring and updating of the guideline

This guideline will be disseminated to Member States through the networks of WHO regional offices and country offices, WHO collaborating centres, United Nations partner agencies, coalitions (e.g. the School Meals Coalition and the Coalition of Action on Healthy Diets from Sustainable Food Systems for Children and All) and civil society agencies, relevant nutrition webpages on the WHO website *(101)* and the electronic mailing lists of the WHO Department of Nutrition and Food Safety, among others. The guideline will also be disseminated at relevant global, regional and national meetings. Specifically, it will be used to support policy dialogues being held as part of the WHO Acceleration Plan to Stop Obesity *(102)*. The guideline is an important part of the technical package to support implementation of the recommendations for the prevention and management of obesity over the life course, and related targets adopted by the Seventy-fifth World Health Assembly *(103)*.

The impact of this guideline can be evaluated by assessing its adoption and adaptation across countries. Evaluation at the global level will be through the periodically conducted Global Nutrition Policy Review, published through GIFNA *(104)* and will also consider independent researcher input. GIFNA is a centralized platform developed by the WHO Department of Nutrition and Food Safety for sharing information on nutrition actions in public health practice implemented around the world. GIFNA currently contains information on thousands of policies (including legislation), nutrition actions, and programmes in all WHO Member States. It includes data and information from many sources, including the first and second WHO global nutrition policy reviews conducted in 2009–2010 and 2016–2017, respectively *(46, 105)*. By providing programmatic implementation details, specific country adaptations and lessons learned, GIFNA serves as a platform for monitoring and evaluating how policy guidelines are being translated and adapted in various countries.

In line with the *WHO handbook for guideline development (67)*, the recommendations in this guideline will be regularly updated, based on new data and information. The WHO Department of Nutrition and Food Safety will be responsible for coordinating updates of the guideline, following the formal procedure described in the *WHO handbook for guideline development (67)*. When the guideline is due for review, WHO will welcome suggestions for additional questions that could be addressed in the guideline.

If there are concerns that one or more of the guideline's recommendations may no longer be valid, the Department of Nutrition and Food Safety will communicate this information, together with plans to update the guideline, to relevant actors via announcements on the Department of Nutrition and Food Safety website and electronic mailing lists, as well communicating directly with actors, as necessary.

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Annex 1.

Global calls to action and commitments related to food environment policies

The WHO guidelines on policies to improve the food environment will contribute to implementation of calls to action relating to nutrition and health, including the:

- Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition;
- Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020;
- Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-Communicable Diseases held in New York in September 2011 and the outcome document (A/RES/68/300) of the High-level Meeting of the General Assembly on the Comprehensive Review and Assessment of the Progress Achieved in the Prevention and Control of Non-communicable Diseases held in New York in July 2014;
- recommendations of the Commission on Ending Childhood Obesity established by the WHO Director-General in May 2014;
- commitments of the Rome Declaration on Nutrition and recommended actions in the Framework for Action, which recommends a set of policy options and strategies to promote diversified, safe and healthy diets at all stages of life; these were adopted by the Second International Conference on Nutrition in 2014 and endorsed by the 136th session of the WHO Executive Board (in January 2015) and the Sixty-eighth World Health Assembly (in May 2015), which called on Member States to implement the commitment of the Rome Declaration on Nutrition across multiple sectors;
- goals of the United Nations Decade of Action on Nutrition (2016–2025), declared by the United Nations General Assembly in April 2016, which include increased action at the national, regional and global levels to achieve the commitments of the Rome Declaration on Nutrition by implementing policy options included in the Framework for Action and evidence-informed programme actions;
- acceleration plan to stop obesity adopted at the Seventy-fifth World Health Assembly in May 2022, together with the intermediate outcome and process targets; and
- 2030 Agenda on Sustainable Development and the Sustainable Development Goals, particularly Goal 2 (“zero hunger”) and Goal 3, Target 4 (“reduce by one third premature mortality from noncommunicable diseases through prevention and treatment”).

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Annex 6.

Guidance questions for the review of contextual factors

Factor	Guidance questions
Values	• What are the values people affected by the intervention assign to the intervention health outcomes?
Resource implications	• What is the value for money of the intervention in terms of cost–benefit ratio/cost–effectiveness/cost utility, including the impact on national/global healthcare costs in the short term and long term, and the impact on government revenue (including the use of additional revenue; and issues of noncompliance, inflation, black market or cross-border trade)?
Equity	• What is the impact of the intervention on (health) (in)equality and/or (health) (in)equity, including food and nutrition security (unequal and/or unfair access to food)? • Is the intervention sensitive to sex, gender, age, ethnicity, religion, culture, language, sexual orientation/gender identity, disability status, education, socioeconomic status, place of residence (including issues of social stigma, household expenditure, financial regressivity, and jobs/employment)?
Human rights	• Is the intervention in accordance with human rights standards, and what is the impact of the intervention on human rights (including the ability to make a competent, informed and voluntary decision)?
Acceptability	• Is the intervention acceptable to governments and policy-makers, the public and consumers, and industry? • Is the intervention acceptable to, and in agreement with, existing cultural and religious norms and beliefs? • Is the intervention aligned with environmental goals and considerations?
Feasibility	• What is the feasibility of developing and implementing the intervention (including barriers and facilitators)? • What is the feasibility of monitoring and enforcement of the intervention (including barriers and facilitators)? • Does the intervention have an impact on change within existing health or food systems (including resulting in additional interventions to improve the nutrition and health of populations)?

Annex 7.
Details of rapid review update

Rationale for conducting the rapid review update

The systematic review underpinning the WHO guideline on policies and interventions to create healthy school food environments was conducted in 2020. It was presented to and reviewed by the guideline development group in March 2021 and published in May 2023. The guideline development group requested a rapid review update be conducted to identify and describe studies published since the original search undertaken for the systematic review to ensure the recommendations reflected the most current evidence. An update was considered necessary given the increased focus on school food and nutrition during and after the COVID-19 pandemic.

Search strategy

In the update, 5 of the 11 databases originally searched for the systematic review were included, covering the period from the previous search (April–May 2020) to October 2023. The five databases were PubMed, Epistemonikos, CINAHL, Africa-Wide Information, and Educational Resources Information Center (ERIC). The selected databases were those in which most of the studies included in the original review had been identified. These databases were also the main source of unique studies (i.e. studies that did not appear in any other databases).

Data collection and analysis

Study selection

The titles and abstracts of the first 100 records were each screened by two reviewers to identify discrepancies in screening between reviewers and standardize the screening process. After this, the remaining titles and abstracts were each screened against the systematic review's eligibility criteria by one reviewer. Potentially eligible full-text records were then screened for inclusion by two reviewers.

Data extraction and management, risk of bias assessment, data analysis and assessment of the certainty of the evidence

The methodology used in the systematic review (1) was also followed during the update, as summarized below.

One reviewer extracted information from the included studies using a piloted data extraction spreadsheet. A second reviewer checked the extracted data. Any discrepancies were resolved through discussion and consensus. Data were extracted for studies that included data on the critical and important outcomes.

One reviewer assessed the risk of bias of all included studies using the Cochrane risk of bias tool, as modified by the Cochrane Effective Practice and Organisation of Care group, which is widely used and validated for use in systematic reviews and for a wide range of study designs. A second reviewer checked the assessments. Separate criteria were applied for controlled studies (RCTs, cRCTs, controlled before-after studies and controlled interrupted time series studies) and uncontrolled interrupted time series studies. Based on the criteria in the tool, each study was assessed as being at low risk of bias (i.e. plausible bias unlikely to alter results), unclear risk of bias (i.e. plausible bias that raises some doubt about the results) or high risk of bias (plausible bias that seriously weakens confidence in results). A study's overall risk of bias was assessed based on its risk of bias for two key domains: selection bias and attrition bias. For example, if a study was at high risk of attrition bias, then its overall risk of bias was high.

When new studies included data on critical and important outcomes, the data were extracted and added to the relevant comparisons and outcomes included in the original systematic review.

The GRADE approach was used to determine the certainty of the evidence for all six critical outcomes and one important outcome (anthropometry). In the updated GRADE evidence profiles (**Annex 8**), any updates to the evidence profiles in the original systematic review are presented in a second row for each outcome. In these rows, the reviewers indicated whether any new studies contributed data to the outcome and whether there were any changes to the certainty assessment. In the updated GRADE evidence profiles, new studies are marked as such. In the updated harvest plots, new studies included in the rapid review update are marked with an asterisk.

Search results

After removing duplicates, 4145 titles and abstracts were screened for relevance. Of these, 134 potentially eligible full-text articles were screened for inclusion. Of these, 94 records were excluded, three studies were ongoing, and one study was classified as "awaiting classification" as it was a conference abstract with insufficient information. Six records were excluded for not reporting any critical or important outcomes and 22 new, unique studies were included for analysis. **Fig. A7.1** shows the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) flow chart of study selection.

Risk of bias of included studies

Fig. A7.2 and **Fig. A7.3** summarize the risk of bias of the studies included in the update.

Fig. A7.1 PRISMA flow chart of study selection

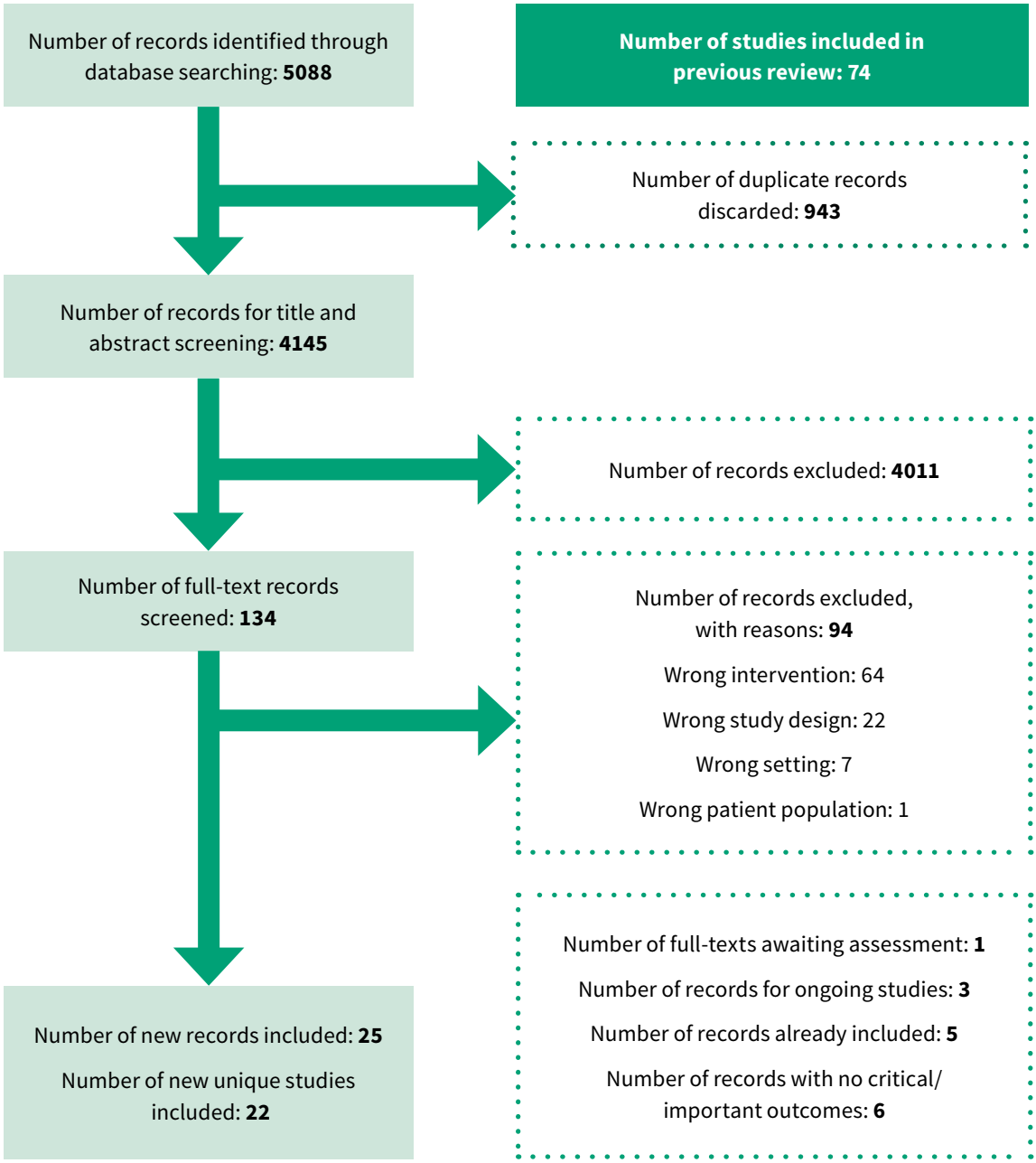
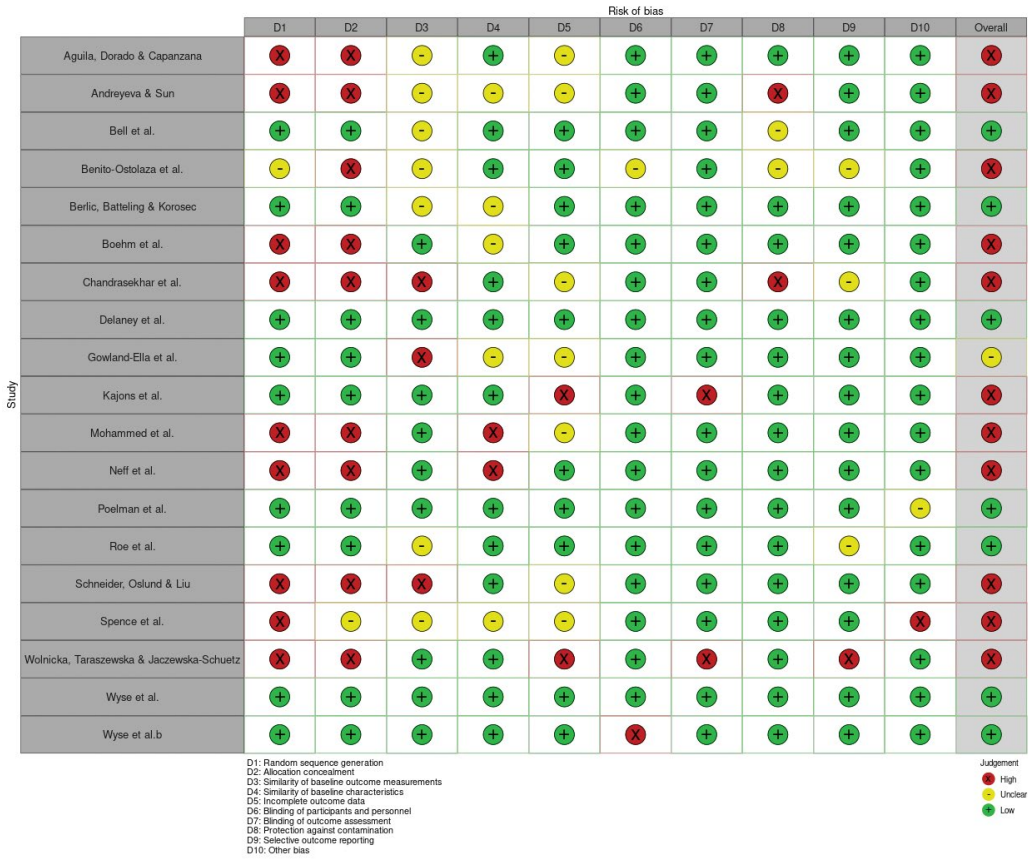
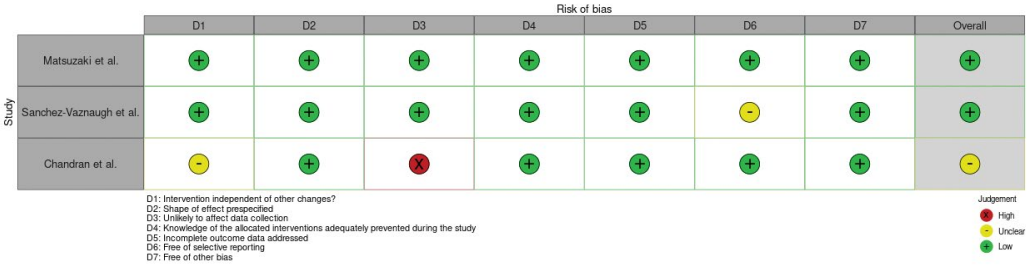


Fig. A7.2 Risk of bias summary for controlled studies



D: domain of bias.
Note: Included studies: Aguila, Dorado & Capanzana *(2)*; Andreyeva & Sun *(3)*; Bell et al. *(4)*; Benito-Ostolaza et al. *(5)*; Berlic, Battelino & Korošec *(6)*; Boehm et al. *(7)*; Chandrasekhar et al. *(8)*; Delaney et al. *(9)*; Gowland-Ella et al. *(10)*; Kajons et al. *(11)*; Mohammed et al. *(12)*; Neff et al. *(13)*; Poelman et al. *(14)*; Roe et al. *(15)*; Schneider, Oslund & Liu *(16)*; Spence et al. *(17)*; Wolnicka, Taraszewska & Jaczewska-Schuetz *(18)*; Wyse et al. *(19)*; and Wyse et al. *(20)*.

Fig. A7.3 Risk of bias summary for uncontrolled interrupted time series studies



D: domain of bias.
Note: Included studies: Matsuzaki et al. *(21)*; Sanchez-Vaznaugh et al. *(22)*; and Chandran et al. *(23)*.
Source: produced with robvis, described by McGuinness & Higgins *(24)*.

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Annex 8.

GRADE evidence profiles

GRADE evidence profile 1

Question: What is the effect on health and other outcomes of direct provision of school meals compared with no intervention?

Setting: Primary and secondary schools in HICs (Denmark, Norway and the United Kingdom of Great Britain and Northern Ireland)

Rapid review update: No new studies identified

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Consumption of foods that contribute to a healthy diet (follow-up: 1 year; assessed with: number of healthy items consumed at breakfast)									
1	Randomized trial	Serious[a]	Not serious	Not serious[b]	Not serious	None	One study *(1)* reported a clear effect favouring the intervention (MD = 0.16; 95% CI: 0.02–0.3; $P < 0.05$; n = 3068 children). However, this effect is not clinically meaningful.	⨁⨁⨁◯ Moderate	Critical
Consumption of foods that do not contribute to a healthy diet (follow-up: 3 months to 1 year; assessed with: unhealthy items consumed at breakfast, consumption of sugar and candy)									
2	Randomized trial	Serious[a]	Not serious	Not serious[c]	Not serious	None	Two studies reported no difference in effect (Moore et al. *(1)*: OR = 1.05; 95% CI: 0.86–1.29; $P > 0.05$; n = 3068 children; Andersen et al. *(2)*: estimate = –3%; 95% CI: –9 to 3; $P = 0{\cdot}29$; n = 744 children).	⨁⨁⨁◯ Moderate	Critical
Diet: energy intake (follow-up: 1–3 months; assessed with: mean kilocalories per day)									
3	Randomized trial	Serious[d]	Serious[e]	Not serious	Serious[f]	None	Two trials examined reduction of undernutrition *(3)(4)*); one of these reported a clear effect favouring the intervention *(3)* and the other reported an unclear effect potentially favouring the intervention *(4)*. One trial *(2)* examined prevention of obesity; it reported an unclear effect potentially favouring the intervention.	⨁◯◯◯ Very low	Critical

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Purchasing behaviour and/or sales data									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Nutrient and calorie content of available food									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Exposure to food marketing of									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Anthropometry: (BMI; assessed with **BMI (kg/m^2) or BMI *z*-score)**									
2	Randomized trial	Serious[a]	Not serious	Not serious	Not serious	None	Two trials examined prevention of obesity *(2, 5)*. Both reported no difference in effect on BMI (kg/m^2) or BMI *z*-score.	⨁⨁⨁◯ Moderate	Important

MD: mean difference; NA: not applicable; OR: odds ratio.

[a] Downgraded once for risk of bias: one or more studies were at unclear overall risk of bias.

[b] Not downgraded for indirectness: although the evidence is from only one study in a HIC, the guideline development group opted not to downgrade for indirectness.

[c] Downgraded once for indirectness: one study was of breakfast provision to primary schoolchildren in Wales (United Kingdom of Great Britain and Northern Ireland) *(1)* and the other was of provision of morning and afternoon snacks and lunch to primary schoolchildren in Denmark, with meals following the Nordic Nutrition Standards *(2)*. These settings may not reflect low-resource settings.

[d] Downgraded once for risk of bias: two studies were at high overall risk of bias and one was at unclear overall risk of bias.

[e] Downgraded once for inconsistency: although all three studies reported the same direction of effect, the magnitude of the effect varied.

[f] Downgraded once for imprecision: two of the three studies had wide CIs.

Question: What is the effect on health and other outcomes of direct provision of fruit and/or vegetables in schools compared with no intervention?

Setting: Primary schools in HICs (Australia, Canada, New Zealand, United Kingdom of Great Britain and Northern Ireland, United States of America)

Rapid review update: New study identified

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Consumption of foods that contribute to a healthy diet (follow-up: 8 weeks to 1 year; assessed with: vegetable and fruit intake score, number of portions of fruit and/or vegetables consumed, cups of fruit and vegetables consumed)									
5	Randomized trial	Serious[a]	Not serious	Not serious	Serious[b]	None	Two studies *(6, 7)* reported a clear effect favouring the intervention, one study *(8)* reported an unclear effect potentially favouring the intervention, and two studies *(9, 10)* reported no difference in effect.	⨁⨁◯◯ Low	Critical
1 (new study from rapid review update)	Observational study	High	NA	NA	NA	NA	One new controlled before-after study *(11)* was identified in the rapid review. The study reported a significant effect favouring the intervention. The study was considered not to affect the evidence profile for this outcome.	NA	NA
Consumption of foods that do not contribute to a healthy diet (follow-up: 1 year; assessed with: consumption of sweets, chocolates, and biscuits (mean servings consumed at school), consumption of cookies and brownies in kilocalories)									
2	Randomized trial	Serious[c]	Not serious	Not serious	Not serious	None	One study *(7)* reported an unclear small effect potentially favouring the intervention (MD = –5.37; P = 0.444; *n* = 4696 children) and one study *(9)* reported no difference in effect (MD = –0.116; 95% CI: –0.289 to 0.056; *n* = 1612 children).	⨁⨁⨁◯ Moderate	Critical
Diet: energy intake (follow-up: 1 year; assessed with: total energy intake (kilocalories per day))									
1	Randomized trial	Serious[d]	Not serious	Not serious	Not serious[e]	None	One study *(7)* reported a small increase in energy intake with the intervention but the 95% CI crossed the null (MD = 47; 95% CI: –21.6 to 115.6; *n* = 4696 children).	⨁⨁⨁◯ Moderate	Critical
Purchasing behaviour and/or sales data									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Nutrient and calorie content of available food									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Exposure to food marketing									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Anthropometry: (BMI) (follow-up: 8 weeks; assessed with: BMI (kg/m²))									
1	Randomized trial	Serious[d]	Not serious	Not serious[f]	Serious[g]	None	One study *(10)* reported a clear effect favouring the control (i.e. an increase in BMI in the intervention group; MD = 0.92; 95% CI: 0.26–1.25).	⨁⨁◯◯ Low	Important

[a] Downgraded once for risk of bias: three studies were at high overall risk of bias and two studies were at unclear overall risk of bias.
[b] Downgraded once for imprecision: two studies had wide CIs.
[c] Downgraded once for risk of bias: two studies were at unclear overall risk of bias.
[d] Downgraded once for risk of bias: one study was at unclear overall risk of bias.
[e] Not downgraded for imprecision. The optimal sample size was met.
[f] Not downgraded for indirectness: although the evidence is from a single study in the United States of America, which may not be representative of other settings, the guideline development group opted to not downgrade for indirectness.
[g] Downgraded once for imprecision: one study had a small sample size and a wide CI.

Question: What is the effect on health and other outcomes of milk provision compared with no intervention?

Setting: Preschools in a HIC (Sweden)

Rapid review update: No new studies identified

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Consumption of foods that contribute to a healthy diet									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Consumption of foods that do not contribute to a healthy diet									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Diet: energy intake									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Purchasing behaviour and /or sales data (follow-up: 4 months; assessed with: percentage of children who selected milk with school lunch)									
1	Randomized trial	Serious[a]	Not serious	Not serious[b]	Not serious	None	One trial *(12)* assessing the provision of milk with school lunch to children in preschool in Sweden reported a clear effect favouring the intervention on the percentage of children selecting milk with their school lunch instead of water.	⨁⨁⨁◯ Moderate	Critical
Nutrient and calorie content of available food									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Exposure to food marketing									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Anthropometry:									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Important

[a] Downgraded once for risk of bias: one study was at unclear risk of selection bias and high risk of attrition bias.

[b] Not downgraded for indirectness: although the evidence is from only one study in a HIC, which may not be representative of other relevant settings where the effects of milk provision could be different, the guideline development group opted not to downgrade for indirectness.

GRADE evidence profile 2

Question: What is the effect on health and other outcomes of nutrition standards or rules increasing the availability of healthy foods at school compared with no intervention?

Setting: Preschools, primary schools and secondary schools in HICs (Australia, Chile, Netherlands (Kingdom of the), Slovenia and United States of America)

Rapid review update: New studies identified

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Consumption of foods that contribute to a healthy diet (follow-up: 1 year; assessed with: consumption of salty snacks meeting nutrition standards (including baked chips, popcorn and pretzels))									
1	Observational study	Not serious[a]	Not serious	Not serious[b]	Not serious	None	One study *(13)* reported a clear effect favouring nutrition standards (MD = 0.29; $P < 0.05$; $n = 996$ children).	⨁⨁◯◯ Low	Critical
Consumption of foods that contribute to a healthy diet (follow-up: 5 days to 12 weeks; assessed with: vegetable intake (average grams over 5 days and grams per day))									
2 (new studies from rapid review update)	Randomized trial	Not serious	Not serious	Not serious	Very serious[c]	None	Two new trials *(14, 15)* reported a clear effect favouring the intervention (SMD = 0.82; 95% CI: 0.04–1.61; $P = 0.04$; $n = 228$ children).	⨁⨁◯◯ Low	Critical
Consumption of foods that do not contribute to a healthy diet (follow-up: 1 year; assessed with: consumption of salty snacks excluded by nutrition standards (including regular chips))									
1	Observational study	Not serious[a]	Not serious	Not serious[b]	Not serious	None	One study *(13)* reported a clear effect favouring nutrition standards (coefficient = –0.3; $P < 0.05$; $n = 996$ children).	⨁⨁◯◯ Low	Critical
Consumption of foods that do not contribute to a healthy diet (follow-up: 5 days; assessed with: average consumption of refined grains and potatoes over 5 days)									
1 (new study from rapid review update)	Randomized trial	Not serious	Not serious	Not serious	Very serious[d]	None	One new study *(14)* reported a clear effect favouring nutrition standards (MD = –69.00; 95% CI: –105.38 to –32.62; $n = 57$ children).	⨁⨁◯◯ Low	Critical
Diet: energy intake (follow-up: 1.3 years; assessed with: monthly energy density)									
1	Observational study	Not serious[a]	Not serious	Not serious[b]	Not serious	None	One study *(16)* reported a clear effect favouring nutrition standards (coefficient = –0.46; $P < 0.001$; $n = 6$ schools).	⨁⨁◯◯ Low	Critical

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Diet: energy intake (follow-up: 5 days; assessed with: average energy intake over 5 days)									
1 (new study from rapid review update)	Randomized trial	Not serious	Not serious	Not serious	Very serious[d]	None	One new study *(14)* reported an unclear effect potentially favouring the intervention (MD = 24.00; 95% CI: –145.44 to 193.44; *P* = 1; *n* = 57 children).	⨁⨁◯◯ Low	Critical
Purchasing behaviour and/ or sales data (follow-up: 1.5–4 months; assessed with: percentage of children selecting low-fat entrées, proportion of favourable food products sold)									
2	Randomized trial	Serious[e]	Not serious	Not serious[b]	Serious[f]	None	One study *(17)* reported an unclear effect potentially favouring the intervention (MD = 0.7; 95% CI: –0.58 to 1.98; *n* = 28 schools). The other study *(18)* reported no increase in the rate of selection of low-fat entrées in the intervention group (no effect estimate reported; *n* = 2 schools).	⨁⨁◯◯ Low	Critical
Purchasing behaviour and/or sales data									
1 (new study from rapid review update)	Observational study	High	NA	NA	NA	NA	One new controlled before-after study *(19)* reported the average share of entrées served with vegetables daily at 4 weeks (difference-in-differences estimator = 0.060; SE: 0.020; *P* < 0.01). The study was considered not to affect the evidence profile for this outcome and would not substitute the data from RCTs in the evidence profile.	NA	NA
Nutrient and calorie content of available food									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Nutrient and calorie content of available food (follow-up: 5 days; assessed with: average 5-day energy content of meals provided)									
1 (new study from rapid review update)	Randomized controlled trial	Not serious	Not serious	Not serious	Very serious[d]	None	One new trial *(14)* reported a clear effect favouring nutrition standards (*P* = 0.031; *n* = 6 schools).	⨁⨁◯◯ Low	Critical

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Exposure to food marketing									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Anthropometry: (BMI for age) (follow-up: 2.8–15 years; assessed with: trends in in BMI for age)									
5 (including 2 new studies from rapid review update)	Observational study	Not serious[a]	Serious[e]	Not serious[b]	Not serious	None	Two studies reported a clear effect favouring nutrition standards (Corvalán et al. *(20)*: β = –0.005; 95% CI: –0.01 to –0.003; and a new study by Chandran et al. *(21)*: trends post-policy: MD = −0.036; 95% CI: −0.060 to −0.012). Two studies with a shorter exposure period reported no effect (Corvalán et al. *(20)*: β = 0.000; P = 0.52; Corvalán et al. *(20)*: β = 0.003; *P* = 0.22). A new study by Aguila, Dorado & Capanzana *(22)* showed no difference.	⨁◯◯◯ Very low	Important

SE: standard error; SMD: standardized mean difference (0.2 = small effect; 0.5 = moderate effect ; 0.8 = large effect *(23)*).

[a] Not downgraded for risk of bias: the study design already starts at low certainty.

[b] Not downgraded for indirectness: although the evidence was from one or more studies in a HIC, which may not be representative of all relevant settings, the guideline development group opted not to downgrade for indirectness.

[c] Downgraded for imprecision: large CI and small sample size.

[d] Downgraded once for imprecision: very small sample size.

[e] Downgraded once for risk of bias: one study was at unclear overall risk of bias and the other was at high overall risk of bias.

[f] Downgraded once for imprecision: one study had a wide CI and the other study did not report an effect measure or a 95% CI.

Question: What is the effect on health and other outcomes of nutrition standards or rules increasing the availability of healthy beverages in school compared with no intervention?

Setting: Secondary schools in a HIC (United States of America)

Rapid review update: No new studies identified

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Consumption of foods that contribute to a healthy diet									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Consumption of foods that do not contribute to a healthy diet (follow-up: 1 year; assessed with: mean servings per day of sugar-sweetened beverages)									
1	Observational study	Not serious[a]	Not serious	Not serious[b]	Not serious	None	One study *(24)* reported no difference in effect for both boys (MD = –0.01; 95% CI: –0.30 to 0.28; *n* = 183) and girls (MD = –0.01; 95% CI: –0.20 to 0.18; *n* = 273).	⨁⨁◯◯ Low	Critical
Diet: energy intake									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Purchasing behaviour and/ or sales data									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Nutrient and calorie content of available food									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Exposure to food marketing									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Anthropometry a									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Important

[a] Not downgraded for risk of bias: the study design already starts at low certainty.

[b] Not downgraded for indirectness: although the evidence is from only one study from a HIC, which may not be representative of all settings, the guideline development group opted not to downgrade for indirectness.

GRADE evidence profile 3

Question: What is the effect on health and other outcomes of nudging interventions that change how food is presented compared with no intervention?

Setting: Preschools, primary schools and secondary schools in HICs (Spain and United States of America)

Rapid review update: New studies identified

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Consumption of foods that contribute to a healthy diet (follow-up: 1 day to 4 weeks; assessed with: consumption of fruit and vegetables, and of white milk)									
6	Randomized trial	Serious[a]	Not serious	Not serious	Serious[b]	None	Three trials *(25–27)* reported a clear effect favouring changes to how food is presented. Three trials *(28–30)* reported an unclear effect potentially favouring the intervention (*n* = 596 children, 12 schools and 76 milk cartons).	⨁⨁◯◯ Low	Critical
Consumption of foods that do not contribute to a healthy diet									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Diet: energy intake (follow-up: 4–6 weeks; assessed with: mean energy intake, fruit intake in kilocalories)									
2	Randomized trial	Very serious[c]	Not serious	Not serious	Serious[d]	None	Two trials reported no difference in effect (Cardoso *(28)*: d = 0.01; *P* > 0.05; *n* = 16 children; Boyer et al. *(31)*: reported "no significant difference" but did not report an effect estimate).	⨁◯◯◯ Very low	Critical
Purchasing behaviour and/or sales data (follow-up: 1–4 weeks; assessed with: percentage of students selecting target food (white milk, fruit and vegetables))									
4 (including 1 new study from rapid review update)	Randomized trial	Serious[e]	Not serious	Not serious	Serious[f]	None	Two trials (one parallel cluster trial and one crossover trial) *(25, 27)* reported clear effects favouring changes in food presentation. Two cluster trials – Goto et al. *(30)* and one new study by Benito-Ostolaza et al. *(32)* – reported an unclear effect potentially favouring changes in food presentation.	⨁⨁◯◯ Low	Critical
Nutrient and calorie content of available food									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Exposure to food marketing									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Anthropometry									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Important

[a] Downgraded once for risk of bias: all studies were at unclear or high overall risk of bias.
[b] Downgraded once for imprecision: most studies had small sample sizes and wide CIs.
[c] Downgraded twice for risk of bias: two studies were at high overall risk of bias.
[d] Downgraded once for imprecision: two trials had very small sample sizes (n = 21 and n = 16 children).
[e] Downgraded once for risk of bias: three trials were at unclear overall risk of bias and one trial was at high risk of bias.
[f] Downgraded once for imprecision: one trial did not report a CI and the two other trials had wide CIs.

Question: What is the effect on health and other outcomes of nudging interventions that change how food is positioned compared with no change to food position?

Setting: Preschools, primary schools and secondary schools in HICs (United Kingdom of Great Britain and Northern Ireland, and United States of America)

Rapid review update: New studies identified

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Consumption of foods that contribute to a healthy diet (follow-up: 3–10 months; assessed with: millilitres of water consumed per child per day, number of times water sources were used per 100 students)									
3	Observational study	Not serious[a]	Not serious	Not serious[b]	Not serious	None	One study *(33)* (n = 12 schools) reported a clear effect favouring the intervention, one study *(34)* (n = 2 schools) reported an unclear effect potentially favouring the intervention, and one study *(30)* reported an unclear effect potentially favouring the control (n = 105 milk cartons).	⨁⨁◯◯ Low	Critical

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Consumption of healthy foods that contribute to a healthy diet(follow-up: 1 week to 12 months; assessed with: proportion of students drinking more than 1 cup of water daily and proportion of white milk consumed of total milk selected)									
3 (new studies from rapid review update)	Randomized trial	Serious[c]	Not serious	Not serious	Not serious	None	Two new trials *(35)(36)* reported no difference in effect. One new trial *(37)* reported an unclear effect potentially favouring the control.	⨁⨁⨁◯ Moderate	Critical
Consumption of foods that do not contribute to a healthy diet									
2 (new studies from rapid review update)	Randomized trial	Serious[d]	Not serious	Not serious	Serious[e]	None	Pooled data from two new trials *(35, 36)* indicates that there is no difference in effect (RR = 0.96; 95% CI: 0.80–1.16; *P* = 0.68; *I2* = 24%).	⨁⨁◯◯ Low	Critical
Diet: energy intake									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Purchasing behaviour or sales data (follow-up: 1–4 weeks; assessed with: percentage of students selecting white milk, proportion of all online lunch orders that contained at least one target fruit or vegetable snack food)									
3 (including 1 new study from rapid review update)	Randomized trial	Serious[f]	Not serious[g]	Not serious	Serious[h]	None	Two trials – Waite *(37)* and a new study by Poelman *(38)* – reported a clear effect favouring the intervention. One cluster trial *(39)* reported an unclear effect potentially favouring the intervention.	⨁⨁◯◯ Low	Critical
Nutrient and calorie content of available food									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Exposure to food marketing									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Anthropometry									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Important

[a] Not downgraded for risk of bias: the study design already starts at low risk of bias.
[b] Not downgraded for indirectness: although the two studies were in HICs and may not be representative of all settings, the guideline development group opted not to downgrade for indirectness.
[c] Downgraded once for risk of bias: two trials were at unclear overall risk of bias and one trial was at high overall risk of bias.
[d] Downgraded once for risk of bias: one trial was at unclear overall risk of bias and one trial was at high overall risk of bias.
[e] Downgraded once for imprecision: a large CI encompassed a 20% reduction and a 16% increase in risk of the outcome.
[f] Downgraded once due to risk of bias: one trial was at high overall risk of bias and one trial was at unclear overall risk of bias.
[g] Not downgraded due to inconsistency because, although there is heterogeneity in effect estimates and the CIs do not overlap, this can be explained by the different interventions implemented and different outcomes measured.
[h] Downgraded once for imprecision: trials had large CIs and one study did not report the number of participants.

Question: What is the effect on health and other outcomes of nudging interventions that change portion size served compared with reference or standard portion size?

Setting: Preschools and primary schools in a HIC (United States of America)

Rapid review update: New studies identified

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Consumption of foods that contribute to a healthy diet (follow-up: 5 days; measured with: vegetable intake, g/day)									
1 (new study from rapid review update)	Randomized trial	Not serious	Not serious	Not serious	Serious[a]	None	Changing how food is positioned likely increases consumption of vegetables. One new trial *(430)* reported a clear effect favouring the intervention (MD = 12 ± 3 g (24%); *P* = 0.0002; *n* = 53 children).	⨁⨁⨁◯ Moderate	Critical
Consumption of foods that do not contribute to a healthy diet									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Diet: energy intake (follow-up: 5 days to 4 weeks; assessed with: energy intake per meal and energy intake per day)									
5 (including 1 new study from rapid review update)	Randomized trial	Serious[b]	Not serious[c]	Not serious[d]	Serious[e]	None	Three crossover trials *(40–42)*, including one new study *(40)*, reported a clear effect favouring the reference portion (i.e. lower energy intake with the reference portion size). One trial *(43)* reported an unclear effect potentially favouring the child-sized dishware (i.e. lower energy intake with the smaller dishware) and one trial *(44)* reported no difference in effect.	⨁⨁◯◯ Low	Critical
Purchasing behaviour or sales data									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Nutrient and calorie content of available food									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Exposure to food marketing									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Anthropometry									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Important

[a] Downgraded once for imprecision: one trial had a very small sample size.
[b] Downgraded once for risk of bias: most studies were at unclear overall risk of bias.
[c] Not downgraded for inconsistency: although the effects are inconsistent, this can be explained by the different interventions and outcomes measured.
[d] Not downgraded for indirectness: although all studies were conducted in the United States of America and the setting may not be representative of all settings, the guideline development group opted not to downgrade for indirectness.
[e] Downgraded once for imprecision: most trials had wide CIs and a small sample size.

Question: What is the effect on health and other outcomes of multiple nudging interventions compared with no intervention?

Setting: Primary and secondary schools in HICs (Australia, United Kingdom of Great Britain and Northern Ireland, and United States of America)

Rapid review update: New studies identified

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Consumption of foods that contribute to a healthy diet (follow-up: 3–6 weeks; assessed with: mean vegetable consumption in grams, units of vegetables consumed per tray)									
2	Randomized trial	Serious[a]	Not serious	Not serious[b]	Not serious	None	One trial reported a small unclear effect potentially favouring the intervention (*n* = 7 schools) *(45)*. One trial reported no changes between the groups but did not report an effect estimate *(46)*.	⨁⨁⨁◯ Moderate	Critical
Consumption of foods that do not contribute to a healthy diet									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Diet: energy intake (follow-up: 3 weeks – 2 months; assessed with: Mean kJ/meal and calories/meal);)									
2	Randomized trial	Not serious	Serious[c]	Not serious[b]	Not serious	None	One trial reported a clear effect favouring the intervention (MD = –567.25; 95% CI: –697.95 to –436.55; P < 0.001 *(47)*). One trial did not report an effect measure but stated there was no difference in effect *(46)*.	⨁⨁⨁◯ Moderate	Critical
Purchasing behaviour or sales data (follow-up: 6 weeks; assessed with: number of units of vegetables selected in an average tray)									
3 (including 2 new studies from rapid review update)	Randomized trial	Not serious	Not serious	Not serious[b]	Not serious	None	Two cluster trials reported a clear effect favouring the intervention – a new study *(48)*: 5.5% 95% CI: 2.2–8.9; *P* = 0.001; *n* = 999 children; and another new study, Wyse et al. *(49)*: OR = 1.69; 95% CI: 1.46–1.96; *n* = 36 148 orders). One cluster trial reported an unclear effect potentially favouring the intervention (Greene *(45)*: percentage points = 24.6; difference-in-difference = 0.246; *P* = 0.074; *n* = 7 schools).	⨁⨁⨁⨁ High	Critical

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Nutrient and calorie content of available food (follow-up: 2–12 months; assessed with: mean energy (kilojoules) per student lunch order)									
2 (new studies from rapid review update)	Randomized trial	Not serious[d]	Serious[e]	Not serious	Not serious[f]	None	One new trial reported a clear effect favouring the intervention *(49)* (−69.4 kJ energy; 95% CI: −119.6 to −19.1; *n* = 1799). One new trial reported an unclear effect potentially favouring the intervention *(48)* (−15.3 kJ energy; 95 % CI: −78.3 to 47.7; *n* = 999).	⨁⨁⨁◯ Moderate	Critical
Exposure to food marketing									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Critical
Anthropometry									
0	NA	NA	NA	NA	NA	NA	None of the studies reported this outcome.	NA	Important

[a] Downgraded once for risk of bias: one study was at unclear overall risk of bias and the other was at high overall risk of bias.
[b] Not downgraded for indirectness: although the evidence is from only one study conducted in a HIC, which may not be representative of other settings, the guideline development group opted not to downgrade for indirectness.
[c] Downgraded once for inconsistency: the direction of effect varied between studies.
[d] Downgraded once for risk of bias: one study was at unclear overall risk of bias.
[e] Downgraded once for inconsistency: the CIs of the two trials do not overlap.
[f] Downgraded once for imprecision: one study with tray data, an unclear sample size analysed and no CI reported.

Question: What is the effect on health and other outcomes of nudging interventions involving menu labelling compared with no intervention?

Setting: Primary school canteens in New South Wales (Australia)

Certainty assessment							Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Consumption of foods that contribute to a healthy diet									
0	NA	NA	NA	NA	NA	NA	NA	NA	Critical
Consumption of foods that do not contribute to a healthy diet									
0	NA	NA	NA	NA	NA	NA	NA	NA	Critical
Diet: energy intake									
0	NA	NA	NA	NA	NA	NA	NA	NA	Critical
Purchasing behaviour or sales data (follow-up: 4 weeks; assessed with: student lunch items purchased that are "everyday" foods)									
1 (new study from rapid review update)	Randomized trial	Not serious	Not serious	Not serious	Not serious	None	One new trial reported a clear effect favouring menu labelling *(50)*.	⨁⨁⨁⨁ High	Critical
Nutrient and calorie content of available food (follow-up: 4 weeks; assessed with: Nutrient /calorie content of available foods: mean energy/saturated fat (g)/sugar (g)/sodium (mg) content of students' online lunch orders)									
1 (new study from rapid review update)	Randomized trial	Not serious	Not serious	Not serious	Not serious	None	One new trial reported a clear effect favouring menu labelling *(50)*.	⨁⨁⨁⨁ High	Critical
Exposure to food marketing									
0	NA	NA	NA	NA	NA	NA	NA	NA	Critical
Anthropometry									
0	NA	NA	NA	NA	NA	NA	NA	NA	Important

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Annex 9.

Summary of declarations of interests of contributors to the guideline development process

NUGAG Subgroup on Policy Actions member	Interests declared and/or identified	Assessment
Nawal Al Hamad	No interests declared	NA
Carukshi Arambepola	No interests declared	NA
Gastón Ares	Declared receiving funding from Conaprole (a Uruguayan dairy company) for a joint research project (2015–2017) with his university (Universidad de la República) for the development of guidelines to reduce the sugar content of dairy products targeted at children	Declarations were not deemed to constitute a risk to the guideline development process given the topic covered by the research (i.e. the development of guidelines to reduce the sugar content of dairy products targeted at children) was not related to the topic of the guideline
Sharon Friel	Declared receiving a research grant from the National Health and Medical Research Council of Australia (NHMRC) to fund the Centre of Research Excellence on Social Determinants of Health Equity (CRE), which ran from 2015 until 2020. The goal of the CRE was to provide evidence on how to navigate the political and policy processes more effectively to operationalize the social determinants of health and health inequity. Also declared receiving a grant from NHMRC for the Australian Prevention Partnership Centre Food Project on systems approaches to healthy and equitable eating	Declarations were not deemed to constitute any conflict of interest for her role in the NUGAG Subgroup on Policy Actions given the topics covered by the funding
Cho-il Kim	No interests declared	NA
Knut-Inge Klepp	Declared that his institution (Norwegian Institute of Public Health) paid for his participation in the first meeting of the NUGAG Subgroup on Policy Actions	Declarations were not deemed to constitute any conflict of interest for his role in the NUGAG Subgroup on Policy Actions given the source of the funding
Joerg Meerpohl	No interests declared	NA
Musonda Mofu	No interests declared	NA
Ladda Mo-suwan	Declared presenting at the Pre-Congress of the 20th Annual meeting of the Pediatric Association in January 2019, on “Nutritional status and dietary intake of young children in Thailand”. Further declared participating in annual meetings of pharmaceutical companies Wyeth and Abbott on infant and young child nutrition in 2016, 2017 and 2018, but no income or honorariums were paid. The meeting invitations were extended through her university (Prince of Songkla University, Thailand) by Wyeth and Abbott, which covered expenses to participate in these annual meetings	Participation in annual meetings of Wyeth and Abbott on infant and young child nutrition and their coverage of her expenses to participate, which was made to her university, were not deemed to constitute a risk to the guideline development process given the focus of the meetings

NUGAG Subgroup on Policy Actions member	Interests declared and/or identified	Assessment
Monica Muti	No interests declared	NA
Celeste Naude	No interests declared	NA
Lisa Powell	Lisa Powell was a coauthor of the systematic review of evidence that informed the guideline. She declared receiving funds from WHO to travel and speak at a WHO/Pan American Health Organization meeting in 2016; for participation at a meeting on fiscal policies held in Bridgetown, Barbados; for participation at the expert consultation in 2017; and for a country visit to support analysis for the Maldives. Also declared that the University of Illinois Chicago, where she is employed, received an academic research grant from Bloomberg Philanthropies	Although her declared interests were not deemed to constitute any conflict of interest for her role in the NUGAG Subgroup on Policy Actions given the source of the funding, due to her coauthorship on the systematic review, she recused herself from providing judgements on the considerations and formulation of the recommendations
Mike Rayner	No interests declared	NA
Eva Rehfuess	No interests declared	NA
Lorena Rodríguez Osiac	No interests declared	NA
Franco Sassi	No interests declared	NA
Barbara Schneeman	Declared that: • until the end of 2012 (retired in January 2013), she was employed by the United States Food and Drug Administration (FDA), which is interested in scientific input for the development of nutrition recommendations; • as the head of the United States of America delegate to the Codex committees on food labelling and on nutrition and foods for special dietary uses, she represented the United States of America positions in these Codex forums (up to 2012); • she was employed by the United States Agency for International Development (USAID) as higher education coordinator from 2015 to 2016, where she worked with the higher education community to increase engagement with USAID; • she was a member of advisory committees at Monsanto Company, discussing the role of agriculture in addressing climate change and improving food and nutrition security (2014–2017), and at the McCormick Science Institute reviewing research proposals on spices and herbs (2014–2021); • she was a temporary adviser for Ocean Spray on health claim petitions that are submitted to FDA related to cranberries (2014–2015); for General Mills on United States of America labelling requirements for nutrition declarations (2014–2016, and 2018); for DSM on Codex Alimentarius processes (2014–2015); for Hampton Creek on labelling standards for mayonnaise (2014–2015); and for a Washington, DC law firm on labelling of genetically modified foods (2014–2015);	Each engagement was assessed in the context of the topic of this guideline. Declared interests – i.e. engagements whether as consultant, presenter, speaker, member of science advisory group with indicated companies – have been on topics related to regulatory issues in the United States of America, and included providing information advice on FDA's labelling regulations including on updates to the Nutrition Facts panel, on health claims and on other FDA requirements for labelling purposes to industry. Other engagements have not involved the topic of this guideline and were not considered to pose a risk for the guideline development. Engagement on the science advisory committee for Monsanto was on issues related to agriculture's role in addressing climate change and food security. Engagement on the advisory committee for the McCormick Science Institute included tasks to review research proposals submitted for funding by the institute. Studies include evaluation of the use of spices and herbs to support consumers to adjust to, e.g. recommendations on reducing intake of added sodium and sugars.

NUGAG Subgroup on Policy Actions member	Interests declared and/or identified	Assessment
	she was a member of the National Academies of Sciences, Engineering, and Medicine (NASEM) and member/chair of the Dietary Guidelines Advisory Committee, involved in reviewing the evidence in developing the national dietary guidelines for the United States of America, Dietary Guidelines for Americans and as such, she: — was nominated to the Dietary Guidelines Advisory Committee of the United States of America by representatives from the North American Branch of the International Life Sciences Institute, American Beverage Association, American Bakers Association's Grain Chain, Grocery Manufacturers Association; USA Dry Pea & Lentil Council, American Pulse Association; and — received honorariums for presentations on the process to develop the Dietary Guidelines for Americans and policies for food labelling in the United States of America at various scientific meetings organized by PMK Assoc. (IFT & AOCS), McCormick Science Institute, Fiber AssocJapan, and Mushroom Council; • she was a Member of the Board of Trustees of the International Food Information Council (IFIC), which ensures that IFIC upholds its responsibilities as a 501(c)(3) non-profit (2021); • she was a government liaison for the International Life Sciences Institute North America, and evaluated research and organized webinars on the microbiome (2018); • she presented a webinar – for which she received no remuneration – to the International Dairy Foods Association on the work of the 2020 Dietary Guidelines Advisory Committee (2020)	The focus of these engagements was not considered to pose a risk for the guideline development. Regarding her membership on the Dietary Guidelines Advisory Committee, the work was done for a national authority and therefore was not considered a conflict of interest. Regarding her nomination to the Dietary Guidelines Advisory Committee by industry groups, there is no relationship or affiliation between nominator and nominee. It was therefore considered that these declared interests do not constitute any conflict of interest for the work being undertaken by the NUGAG Subgroup on Policy Actions
Reema Tayyem	No interests declared	NA
Alison Tedstone	No interests declared	NA
Anne Marie Thow	Declared receiving funding from WHO for consultancies to analyse trade, fiscal and nutrition policies, and to support nutrition policies in Pacific Island countries in 2015 and 2017. Further declared receiving funding from the Food and Agriculture Organization of the United Nations and the Asian Development Bank, through her university (University of Sydney) for consulting	Declarations were not deemed to constitute any conflict of interest for her role in the NUGAG Subgroup on Policy Actions given the source of the funding
Edelweiss Wentzel-Viljoen	Declared receiving funding from the South African Medical Research Council during 2014–2016 for research on salt reduction and hypertension. Further declared being a Board member of the Heart and Stroke Foundation South Africa	Declarations were not deemed to constitute any conflict of interest for her role in the NUGAG Subgroup on Policy Actions given the source of and topic covered by the funding

Systematic review team	Interests declared and/or identified	Assessment
Eugene Davids	No interests declared	NA
Solange Durão	No interests declared	NA
Annette Gerritsen	No interests declared	NA
Tamara Kredo	No interests declared	NA
Maryke Wilkinson	No interests declared	NA

Methods expert	Interests declared and/or identified	Assessment
Elie Akl	No interests declared	NA
Damian Francis	No interests declared	NA

Peer reviewers	Interests declared and/or identified	Assessment
Robert Akparibo	No interests declared	NA
Cristina Álvarez	No interests declared	NA
Gina Ambrosini	Declared being a witness and providing expert advice in her capacity as Principal Policy Officer, Department of Health, Western Australia, to a Parliamentary Inquiry into the most effective ways for Western Australia to address food insecurity for children and young people affected by poverty' in 2023. She declared providing evidence regarding school lunch programmes and healthy food programmes in schools in Western Australia	Declarations were not deemed to constitute any conflict of interest for her role as peer reviewer given the nature of advice provided during her role as government officer
Ayesha Lokubalasooriya	No interests declared	NA
Ma Yinghua	No interests declared	NA
Kwadzanai Rudo L. Nyanungo	Declared processing of related documents and being involved in the Zimbabwe School Nutrition Guidelines from 2021 to 2023	Declarations were not deemed to constitute any conflict of interest for her role as peer reviewer as the activities related to her role as Chief Director responsible for School Nutrition
Nicoliene Oudwater	No interests declared	NA
Brian Payne	No interests declared	NA
Katherine Shats	No interests declared	NA
Melissa Vargas	No interests declared	NA
Katarina Wahlgren	No interests declared	NA

Declared interests were discussed with the Office of Compliance, Risk Management and Ethics (CRE)/WHO.

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