



WHO guideline on fiscal policies to promote healthy diets

DRAFT WHO GUIDELINE FOR PUBLIC CONSULTATION

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Abbreviations and acronyms

BMI	body mass index
CI	confidence interval
GINA	Global database on the Implementation of Nutrition Action
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HIC	high-income country
LMIC	low- and middle-income country
NCD	noncommunicable disease
NUGAG	Nutrition Guidance Expert Advisory Group
PICO	population, intervention, comparator and outcome
RCT	randomized controlled trial
SES	socioeconomic status
SSB	sugar-sweetened beverage
UN	United Nations
UNGA	United Nations General Assembly
USA	United States of America
VAT	value-added tax
WHO	World Health Organization

Glossary

Ad valorem excise tax: An excise tax applied as a percentage of the value of a product (1). Ad valorem excise taxes can be based on different types of values, including the cost, insurance, freight (CIF) value (for imports), ex-factory price, wholesale price or retail price.

Consumption tax: A tax that is levied on the consumption of goods and services rather than their production. Consumption taxes are indirect taxes and include excise taxes and sales taxes.

Discretionary food: Foods and non-alcoholic beverages that are high in saturated fatty acids, *trans*-fatty acids, free sugars and/or salt, usually highly processed, and are not considered necessary for a healthy diet.

Excise tax: An indirect consumption tax applied to a specific product (1). An excise tax may be applied as an ad valorem excise tax or a specific excise tax or a combination of the two (2). Because of their relatively narrow focus and because they lead to price increases in the targeted product relative to other products, excise taxes can have a powerful impact on consumer decision making and are therefore commonly used as policy instruments to attain policy goals beyond revenue generation.

Food: Includes both foods and beverages. In the context of this guideline, beverages refer to non-alcoholic beverages.

Indirect tax: A tax that is collected by an intermediary such as a manufacturer or retail store on behalf of the person who bears the ultimate economic burden of the tax such as the consumer. Indirect taxes are indirect in the sense that they are not levied directly from tax payers' income or gains like direct taxes are. Indirect taxes include excise taxes, sales taxes and tariffs.

Nutrient profiling: The science of classifying or ranking foods according to their nutritional composition for reasons related to preventing disease and promoting health (3).

Pass-through rate: The proportion of a consumption tax that is transferred onto the price paid by consumers (4).

Own-price elasticity of demand: Measures the responsiveness of consumer demand to changes in prices. For example, an own-price elasticity of demand of -0.5 means that a 10% increase in price would lead to a 5% reduction in demand (2). In other words, it is the percentage change in demand for a given product resulting from a 1% increase in its price.

Progressive or Regressive: Properties of a tax, or a tax system, qualifying how the tax burden is distributed among people with different incomes. A progressive tax is one that weighs more on people with higher incomes (in terms of the proportion of their disposable income or total consumption expenditure represented by the tax they pay). Conversely, a regressive tax is one that weighs more on people with lower incomes. Typically, these properties are defined in connection with the financial burden of a tax, i.e. the tax payments, borne by taxpayers, without considering the distribution of the wider health and economic effects of a tax, including those caused by changes in behaviour triggered by the tax (2).

Sales tax: Consumption taxes that are levied on almost all goods and services. Sales taxes are collected from consumers at point of purchase (4). Unlike excise taxes, sales taxes are usually applied as a uniform rate on all goods and services, leaving the relative prices of specific goods and services unaffected.

Specific excise tax: An excise tax applied as a specific monetary amount per unit volume or quantity (e.g. sugar content) (1). Specific excise taxes are sometimes also referred to as volumetric, ad quantum, or per unit taxes.

Substitution: An effect caused by a rise in price that induces a consumer to buy more of a relatively lower-priced good and less of a higher-priced one.

Tax base: Specifies how the tax liability on the taxable products should be determined. For example, for ad valorem excise taxes the tax base is the value of the product, such as the cost, insurance, freight (CIF) value (for imports), ex-factory price, wholesale price or retail price. For specific taxes, the tax base can be the fixed quantity or unit volume upon which the tax rate is applied (5).

Taxable products: The set of products to which a tax is applied (1).

Tax structure: Refers to the way a tax is designed. Excise taxes can be applied at a uniform (unique or the same) tax rate or a differential (tiered) rate. They can be also specific in nature, ad valorem or a mix of the two.

Tiered tax: Used to describe a tax structure whereby rates vary within a taxed product category based on product characteristics (e.g. sugar content in sugar-sweetened beverages) (1).

Value-added tax (VAT): A multistage tax on goods and services that is levied on the value-add generated at each stage of the supply chain. The tax is eventually borne by final consumers (2). VAT

is usually applied as a uniform rate on all goods and services, leaving the relative prices of specific goods and services unaffected.

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Executive summary

Introduction

Unhealthy diets are a leading global public health risk, contributing to all forms of malnutrition and to noncommunicable disease (NCD) morbidity and mortality (6, 7).

Governments play a leading role in promoting healthy diets, addressing malnutrition in all its forms and reducing the burden of diet-related NCDs. They can take action through public policies to create a health-promoting food environment that is conducive to a healthy diet and facilitates healthy dietary decisions (8-10).

Affordability of food (which is a function of food price and disposable income) is a key characteristic of the food environment and is well established as an important influence on food purchases and consumption (11). Although the cost of a healthy diet differs across major world regions and World Bank income groupings (12), a healthy diet that reflects global guidance¹ is currently unaffordable for almost 3.1 billion people (13). The inverse relationship between food prices and purchases and consumption indicates that taxes reduce, and subsidies increase, consumption of targeted foods (14).

Implementing fiscal policies to promote healthy diets has been proposed in various documents adopted by the World Health Assembly, including the Global Strategy on Diet, Physical Activity and Health (15); the Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition (16); and the Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020² (17).

In recent years, an increasing number of countries have implemented fiscal policies to promote healthy diets – in particular, taxes on sugar-sweetened beverage (SSBs) (18, 19). As of 2022, 85 countries³ implemented SSB taxes at a national level, and three countries at a subnational or municipal level, while 29 countries⁴ implemented national level taxes on less healthy food products. However, fewer countries have implemented policies to subsidize healthier foods and beverages,⁵ or

¹ In this analysis, a “healthy diet” was based on average food group amounts recommended by food-based dietary guidelines from 10 countries.

² 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.

³ Based on data from the WHO Global database on the Implementation of Nutrition Action (GINA) and the WHO Noncommunicable Disease Document Repository.

⁴ This number was collated by WHO from the WHO Global database on the Implementation of Nutrition Action (GINA) and the WHO Noncommunicable Disease Document Repository.

⁵ Subsidies on healthier foods and beverages were reported by nine countries in the WHO Global Nutrition Policy Review 2016–2017, of which four provided details.

remove taxes on healthier food products⁶ or subsidies on less healthy food products⁷ as a means of encouraging healthier dietary patterns (18). Despite progress in this area, governments continue to face challenges in their attempts to develop fiscal policies to promote healthy diets, often resulting in weakened, delayed or defeated policies.

In response to Member State requests, to provide evidence-based guidance, and to strengthen and streamline support for Member States in developing and implementing new, or strengthening existing, fiscal policies to effectively promote healthy diets, the World Health Organization (WHO) began the process of developing this guideline. Recognizing the broad range of fiscal measures governments can use for health promotion, the scope of this guideline is limited to taxation of foods and SSBs, and to a subset of food subsidies with the primary intention to change consumer behaviour by lowering prices of targeted foods at retail level.

The WHO Department of Nutrition and Food Safety established the WHO Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Policy Actions to support the work of WHO in developing evidence-informed guidelines on food environment policies related to food marketing (20), taxes and subsidies, nutrition labelling (21), and the school food environment (22). This WHO guideline focuses on fiscal policies to promote healthy diets. It is in line with other WHO guidance on promoting healthy diets, including guidelines on dietary goals relating to sodium (23) and sugars (24); forthcoming guidelines on total fat, saturated fatty acids and *trans*-fatty acids, polyunsaturated fatty acids, carbohydrates, use of non-sugar sweeteners and use of low-sodium salt substitutes; and the recommendations of the WHO Commission on Ending Childhood Obesity (25).

Adaptation and implementation of this guideline can be supported using tools developed by WHO, including the WHO manual on SSB taxation policies (5).

⁶ Removing taxes from healthier foods and beverages was reported by six countries in the WHO Global Nutrition Policy Review 2016–2017, of which four provided details.

⁷ Removing subsidies on foods and beverages that are inconsistent with a healthy diet was reported by four countries in the WHO Global Nutrition Policy Review 2016–2017; all provided details.

Objectives

Complementing global and regional guidance on fiscal policies, and recognizing that there is a large body of evidence on the impacts of fiscal measures for health promotion, the objectives of this guideline are to:

- provide Member States with recommendations and implementation considerations, based on evidence specific to taxation of foods and SSBs and to a subset of food subsidies with the primary intention to change consumer behaviour by lowering prices of targeted foods;
- enable evidence-informed advocacy to advance action on fiscal policies to promote healthy diets;
- guide further research to further strengthen the evidence base for action on fiscal policies to promote healthy diets; and
- contribute to the creation of food environments that enable healthy dietary practices among children.

The recommendations in this guideline can be used by policy-makers in health and finance/tax authorities, food regulators and other actors to advocate for and - in combination with the WHO manual on sugar-sweetened beverage taxation policies - to develop and implement new, or strengthen existing, fiscal policies to promote healthy diets, improve the health and nutritional status of all people, and ultimately reduce the burden of diet-related NCDs to accelerate achievement of the United Nations Sustainable Development Goals.

Methods

This guideline was developed by the WHO Department of Nutrition and Food Safety using the procedures outlined in the *WHO handbook for guideline development* (26), with extensive feedback provided by the Department of Health Promotion. An internal steering committee provided initial input to the guideline development process. An international multidisciplinary guideline development group, the NUGAG Subgroup on Policy Actions, was convened with the main functions of determining the scope and key question of the guideline (informed by a scoping review), reviewing the evidence and formulating evidence-informed recommendations.

The NUGAG Subgroup on Policy Actions determined the following key question of the guideline through discussion and consensus:

- What is the effect in adults and children on priority outcomes of implementing a fiscal and/or pricing policy compared with not implementing the policy?

The fiscal policies included for consideration were measures taken to tax less healthy or subsidize healthier food and non-alcoholic beverage products. Taxes of any nature (e.g. excise, sales) and a subset of food subsidies with the primary intention to change consumer behaviour by lowering prices of targeted foods at retail level (e.g. food vouchers, discounts, inclusion of food in public distribution systems, reduction of VAT) were included. The guideline does not cover subsidies at the level of food production and agricultural subsidies (i.e. subsidies to manufacturers or farmers) or trade policy instruments (e.g. import tariffs). School meal or food subsidies were not included. School food provision is reviewed in a forthcoming WHO guideline on school food and nutrition policies. The pricing policies included for consideration were measures taken to restrict price promotions, or implement minimum price policies (price floors) or maximum price policies (price ceilings), on food and non-alcoholic beverage products.

The NUGAG Subgroup on Policy Actions considered the outcomes of price change, purchases: direct effects, purchases: substitution effects, consumption: direct effects, consumption: substitution effects, and dietary intake as critical for decision-making. Other outcomes considered were the longer-term health outcomes of body weight status, diet-related NCDs, undernutrition and pregnancy outcomes and the non-health outcomes of product changes, and unintended consequences to wider society. These longer-term outcomes and non-health outcomes were considered important, but not critical for decision-making.

Evidence relating to the key question was retrieved through a systematic review, which was published as two peer-reviewed articles, on fiscal and pricing policies for non-alcoholic beverages (27) and for foods (28). The Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach was used to assess the level of certainty in the evidence for each outcome gathered through the systematic review. The GRADE approach for assessing the level of certainty in the evidence provides a transparent approach to grading the certainty of evidence for each outcome included in key questions. The certainty of evidence (also known as the quality of evidence) indicates the level of confidence that the effects of an intervention as observed in a body of evidence (i.e. a set of scientific studies) reflect the true effects that would occur in real-world settings. There are four levels of certainty of evidence: very low, low, moderate and high. Bodies of evidence based on randomized controlled trials (RCTs) start at high certainty and bodies of evidence based on observational studies at low certainty. This is based on the assumption that randomization is the best method to control for unknown variables that influence effect estimates. Importantly, the majority of studies contributing to the body of evidence considered for food environment policy guidelines are observational. The certainty of evidence is then potentially downgraded, depending on limitations in study design and

execution; risk of bias, indirectness; imprecision; inconsistency; and publication bias. The certainty of evidence for a body of evidence based on observational studies can also be upgraded (if it has not already been downgraded) depending on dose-response gradient, direction of plausible bias, and size of the effect.

Evidence on contextual factors (resource implications, equity and human rights, acceptability and feasibility) was reviewed and assessed in a separate review (29).

The NUGAG Subgroup on Policy Actions discussed and assessed the outcomes of the evidence reviews, drafted recommendations and reached consensus on the direction and strength of the recommendations using the GRADE approach. After rating the certainty of evidence for each outcome, the guideline development group made a judgement on the overall certainty of evidence by reflecting on the validity, precision, consistency, and applicability of the measures of effect, and taking the pathway of effect of the entire body of evidence into consideration. The overall certainty of the evidence was based on the certainty of the body of evidence for the most critical outcomes, which were price change and purchases: direct effects. The GRADE approach makes an explicit separation of the process for assessing the level of certainty in the evidence from the process for making recommendations. The latter process takes a number of additional contextual factors (resource implications, equity and human rights, acceptability and feasibility) into consideration (30). The level of certainty of evidence does not imply a particular strength of recommendation; high certainty evidence does *not* necessarily mean a strong recommendation will be made, and a strong recommendation can be made with low or very low certainty evidence, depending on additional considerations.

Pricing policies were considered in scope for both the systematic review and the review of contextual factors. However, no recommendation was made for pricing policies because no studies on the effectiveness of such policies were identified by the systematic review.

All members of the NUGAG Subgroup on Policy Actions, members of the systematic review team, external resource people participating in guideline development meetings and reviewers of the draft guideline completed declaration of interest forms. The procedures for management of interests outlined in the *Guidelines for declaration of interests (WHO experts)* (31) were strictly followed.

The evidence

The systematic review assessed the evidence of effectiveness of implementing the fiscal policies included in the key question (27, 28). Modelling studies were considered by the NUGAG Subgroup on Policy Actions to complement evidence from the systematic review on food taxes. Although the search

strategy included terms relevant to pricing policies, no eligible studies were identified for pricing policies. The evaluated tax and subsidy policies included in the review varied in their coverage, rate and products taxed or subsidized.

Taxation of SSBs

Eighty-six studies, all observational, provided evidence on the impact of a taxes on SSBs. The effects of an SSB tax on the outcomes of price change of taxed beverages and purchases of taxed beverages were large and significant, which allowed for the upgrading of the certainty of the evidence for these outcomes. The pass-through rate – that is, the rate of a tax that is transferred onto the price paid by consumers – was 82% (95% confidence interval (CI): 66% to 98%) and taxes on SSBs significantly decreased purchases of taxed beverages (a measure of direct effects), with an own-price elasticity of -1.59 (95% CI: -2.11 to -1.08). The own-price elasticity of -1.59 indicates that a 10% tax-induced price increase would reduce purchases of SSBs by about 16%. The evidence on the effects of taxes on SSBs on purchases of *untaxed* beverages (a measure of substitution effects; price elasticity = 0.42; 95% CI: -0.52 to 1.35), self-reported consumption of taxed beverages (a measure of direct effects; price elasticity = -3.78 ; 95% CI: -8.86 to 1.30), self-reported consumption of untaxed beverages (a measure of substitution effects; price elasticity = 0.54; 95% CI: -0.60 to 1.68), and dietary intake was less certain, though studies evaluating excise taxes showed decreases in consumption of taxed beverages. For the outcome of body weight, the evidence was also less certain, while no eligible studies were identified for diet-related NCDs, undernutrition or pregnancy outcomes. Most taxes on SSBs have been recently implemented and changes in these outcomes typically occur gradually over time, which explains the limited evidence on these longer-term health outcomes. Evidence was also less certain for non-health outcomes, including product changes (though all three assessed taxes resulted in reductions in sugars or calorie content of beverages).

Taxation of foods or nutrients

Far fewer eligible studies were identified that evaluated the effect of a tax policy on food or nutrients and the evidence on taxes on foods or nutrients⁸ – provided by 19⁹ observational studies from five countries – was less certain than that of taxes on SSBs.

⁸ These foods were defined by the tax policies. They included “non-essential energy-dense foods”, foods high in saturated fatty acids, and snacks high in sugars and salt. For more details of the included policies, see Annex 8.

⁹ The number of studies reporting on taxation of foods or nutrients (19) is less than the sum of the number of studies reporting on taxation of food (15) and taxation of saturated fat (5), as one study reported on both taxes on food (in Hungary, Denmark and Finland) and a tax on saturated fat (in Denmark).

Ten studies evaluated taxes on “non-essential energy-dense” foods implemented in Mexico; three evaluated state sales taxes in the United States of America; one evaluated the public health product tax in Hungary; and one evaluated national excise taxes in Hungary, Denmark and Finland. There was very low certainty evidence on the effect of taxes on foods on price change, purchases of taxed foods (a measure of direct effects), purchases of untaxed foods (a measure of substitution effects), unintended consequences and body weight status; no eligible studies were identified for consumption of taxed foods (a measure of direct effects), consumption of untaxed foods (a measure of substitution effects), diet, product changes, diet-related NCDs, undernutrition and pregnancy outcomes.

Five studies evaluated a tax on saturated fat (a national tax in Denmark), which was only in place for a limited duration. There was very low certainty evidence about the effect of taxes on saturated fats on the price of taxed foods, purchases of taxed foods (a measure of direct effects) and purchases of untaxed foods (a measure of substitution effects). No eligible studies were identified for the remaining outcomes.

The systematic review included only real-world policy evaluations, of which there were a limited number. Evidence from modelling studies was therefore also considered by the NUGAG Subgroup on Policy Actions, which shows that food taxes – if well designed – are expected to have a desirable and large effect on health-related outcomes (32-35).

Subsidy on foods that contribute to a healthy diet

Thirty-two studies, 10 of which were RCTs and 22 observational studies, provided evidence on a subset of food subsidies with the primary intention to change consumer behaviour by lowering prices of targeted foods at retail level. More specifically, studies evaluated various vouchers for and discounts on fruit and vegetables for low-income households in the US; food vouchers for low-income pregnant women and low-income households in the UK; a subsidised fruit and vegetable box programme targeting low-income Aboriginal families with young children in Australia; discounted pulses and fortified wheat flour for eligible households in India; and the reduction of value-added tax (VAT) on fruits and vegetables in Latvia. All except one subsidy policy (i.e. the VAT reduction) targeted low-income populations. The certainty of evidence of this subset of subsidies was very low for all outcomes for which studies were identified, including purchases, consumption, diet and body weight status, undernutrition and price change. However, available studies consistently showed a significant increase in purchase of subsidized fruits and vegetables.

Evidence on contextual factors

The review of contextual factors provided additional information on values, resource implications, equity and human rights, acceptability, and feasibility (29). With regard to human rights, Special Rapporteurs on the right of everyone to the enjoyment of the highest attainable standard of health and on the right to food have called for healthy foods to be made economically accessible, and have recommended taxes on SSBs and on foods high in saturated fatty acids, *trans*-fatty acids, sodium and/or sugars; these taxes can be used to subsidize access to fruits and vegetables and for educational campaigns on healthy diets. Taxes on less healthy food options and subsidies for foods that contribute to a healthy diet appear to be among the interventions to promote healthy diets that are most likely to decrease health inequalities, possibly as a result of upstream changes to the food environment. Modelling studies generally found taxes on SSBs, taxes on unhealthy foods, subsidies or rewards, or combinations of subsidies and taxes to be cost-effective or cost-saving. The existence of such policies indicates their feasibility and acceptability to government and policy-makers. The increasing number of countries implementing SSB taxes suggests that these taxes may be more acceptable than other fiscal policies. Evidence from a systematic review and meta-analysis showed that 39–66% of the public supported an SSB tax, with the variation in acceptability linked to tax framing and hypothecation. The use of tax revenue for health purposes is linked to greater public acceptability of taxes. Governments have used tax revenue for, for example, healthcare programmes and salaries of healthcare professionals, for healthy food incentives, school food programmes or community development. Acceptability by the industry of taxes on foods and non-alcoholic beverages appeared very low, with multiple examples of lobbying against taxes and interference in policy processes. The policy designs that will be feasible will be country-specific and depend, for example, on existing governmental infrastructure and taxation mechanisms.

WHO Recommendations

Based on the review of evidence described above, consideration of contextual factors, and expert opinion, the WHO NUGAG Subgroup on Policy Actions formulated the below recommendations on taxation of foods and SSBs and on a subset of food subsidies.

Recommendation 1

WHO recommends implementation of a policy to tax sugar-sweetened beverages (SSBs).

Strong recommendation

Rationale

- This strong recommendation is supported by evidence of a large desirable intervention effect on two critical outcomes, i.e. price change and purchases. Due to the large effect, the certainty of observational evidence was deemed moderate. The strong recommendation is further supported by negligible costs of implementation, favourable cost-effectiveness, evidence of acceptability and feasibility, and the potential that the intervention increases equity and probably increases human rights.

Remarks

- For this recommendation, SSBs refer to a broad set of non-alcoholic beverages. They are defined as all types of beverages containing free sugars,^{10,11} including carbonated or non-carbonated soft drinks, fruit and/or vegetable juice¹² and drinks, nectars, liquid and powder concentrates, flavoured water, vitamin waters, energy and sports drinks, ready-to-drink teas, ready-to-drink coffee, flavoured milks and milk-based drinks, and plant-based milk substitutes.
- This recommendation covers SSBs purchased for either adults or children.
- Implementing a policy to tax SSBs increases their prices. Consumers respond to tax-induced price increases by reducing their purchases.
- The effect of the tax on purchases is proportional to the price increase triggered by the tax.

¹⁰ Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates (WHO *Guideline: sugars intake for adults and children*, 2015; http://www.who.int/nutrition/publications/guidelines/sugars_intake/en/).

¹¹ Taxation policies that contributed to the evidence included policies relating to both SSBs and beverages sweetened with non-sugar sweeteners (NSSBs). However, it was not possible to identify a difference in effectiveness between taxes that target SSBs only and those that target SSBs and NSSBs.

¹² None of the policies in the evidence base for this recommendation included fruit juices as a taxable product. However, reducing consumption of fruit juices could contribute to reducing overall sugars intake because of the sugars content of fruit juices.

- Implementation of policies to tax SSBs thereby has the potential to influence consumption of SSBs.
- Implementing a policy to tax SSBs may also encourage product changes and reformulation, and lead to a decrease in sugars content of the taxed beverages. For example, taxes levied at higher rates on products containing more sugar (e.g. tiered taxes) can provide incentives for manufacturers to reformulate their products and for consumers to switch to products containing less sugar.
- The effectiveness of a policy depends on its design and administration. Policy design considerations include the type of tax, the tax rate, taxable products and the nutrient profile model used to define taxable products, as well as possible substitution effects of the tax.
- Evidence from subnational studies suggests that the effect of the tax may be affected by cross-border shopping.
- The regressivity of a tax on SSBs is a narrow view of the impact of the tax looking at the burden of a tax with respect to income and ignoring other wider aspects such as impact on expenditures and economic gains from the health impact gains following a reduction of use due to the tax.

Recommendation 2

WHO suggests implementation of a policy to tax foods inconsistent with a healthy diet.

Conditional recommendation

Rationale

- This conditional recommendation was formulated based on the very low certainty evidence from a limited number of real-world policy evaluations and evidence from modelling studies that food taxes – if well designed – would be expected to have a desirable and large effect. The recommendation was further supported by evidence on probable acceptability and feasibility, on probably favourable cost-effectiveness and the potential that the intervention may increase equity and human rights.

Remarks

- For this recommendation, “foods inconsistent with a healthy diet” refers to foods that are high in saturated fatty acids, *trans*-fatty acids, free sugars and/or salt, usually highly processed, and may fall into a discretionary food category.
- This recommendation covers such foods purchased for either adults or children.
- Price changes that affect the cost of foods can influence decisions on food purchases. Taxation of foods can raise their price and provide a disincentive to purchase.
- Although there are variations in policy designs, implementation of a policy to tax foods may reduce purchases of taxed foods as a consequence of price increases, and has the potential to affect their consumption.
- A single nutrient tax (based on evidence from a tax on saturated fatty acids) may also increase prices and reduce purchases of taxed products. However, such a tax is likely to have a broad range of taxable products and could include foods that do not fall into a discretionary food category.
- The effectiveness of a policy depends on its design and administration. Policy design considerations include the type of tax, the tax rate, taxable products, and the nutrient profile model used to define taxable products, as well as possible substitution effects of the tax.
- The regressivity of a tax on foods is a narrow view of the impact of the tax looking at the burden of a tax with respect to income and ignoring other wider aspects such as impact on expenditures and economic gains from the health impact gains following a reduction of use due to the tax.

Recommendation 3

WHO suggests implementation of a policy to subsidize foods that contribute to a healthy diet.

Conditional recommendation

Rationale

- This conditional recommendation was formulated based on the very low certainty of evidence on a subset of targeted food subsidies, as the evidence appears to indicate desirable effects. The recommendation was further supported by evidence on the probable acceptability and feasibility, on probably favourable cost-effectiveness and the potential that the intervention may increase equity and human rights.

Remarks

- This recommendation is made based on evidence from a subset of targeted food subsidies that provide price incentives to consumers at the retail level (including through rebates, discounts, monetary vouchers or coupons or removal of a value added tax on the target food).
- For this recommendation, examples of “foods that contribute to a healthy diet” are vegetables and fruit, legumes and whole grains.
- This recommendation covers such foods purchased for adults and children.
- Price changes that affect the cost of food can influence decisions on food purchases. A subsidy on foods that contribute to a healthy diet can reduce their price and provide an incentive to purchase.
- Although there are variations in policy designs, implementation of a policy to subsidize foods that contribute to a healthy diet may increase purchases of the subsidized food among the target population, suggesting a potential benefit.
- Inequities exist in nutrition status and diet-related health status, with lower-income populations bearing a disproportionate burden of disease, and subsidies may reduce such inequities.
- The effectiveness of a policy to subsidize foods that contribute to a healthy diet must consider the country context, and depends on a number of policy design elements, including how subsidies are delivered, the geographical distribution of subsidies, to whom subsidies are delivered and which foods are subsidized.

Implementation considerations

The causes of malnutrition are complex, and no single intervention will reduce malnutrition in all its forms. Fiscal policies to promote healthy diets are best implemented as part of a comprehensive policy approach to create enabling and supportive food environments. The recommendations in this guideline should be considered alongside other relevant WHO guidelines and recommendations, including forthcoming WHO guidelines on marketing policies, school food and nutrition policies, and nutrition labelling policies (20-22). The implementation considerations discussed in this guideline are not exhaustive, but rather reflect key considerations identified through the review of contextual factors and deliberations of the NUGAG Subgroup on Policy Actions. Detailed guidance on the implementation of SSB taxation, can be found in the WHO manual on SSB taxation policies (5). Additional global and regional implementation resources on fiscal policies to promote healthy diets (1, 5, 36), and on taxation in general (2), may serve as useful references to support implementation of the recommendations in this guideline and to ensure that general principles of tax design are taken into account.

The recommendations may require adaptation to the local context of WHO regions and Member States, including the country's nutritional situation, cultural context, locally available foods, dietary customs, available resources and capacities, and existing policies and governance structures. Also important are the country's institutional arrangements relevant to fiscal policies – for example, designation of competent authorities for the implementation and enforcement of fiscal policies, including tax laws.

Poorly designed fiscal policies will not be successful in promoting healthy diets. To ensure their effectiveness, policies should be well designed, with consideration given to policy design elements, in line with those presented in this guideline's recommendations, and detailed in the above-mentioned manual (5). These elements include the products subject to a tax or subsidy, the tax or subsidy rate, the tax type, structure and base.

Determining what food or beverage to tax or subsidize is paramount. Nutrient profiling can help define the target foods of a fiscal policy, by providing a means of differentiating between foods that are more and less likely to be part of a healthy diet. Although a single nutrient tax on food – for example, a tax on saturated fatty acids – may also increase prices and reduce purchases of taxed products, evidence on the desirable or undesirable effects of such taxes is still limited. A nutrient-based food tax is likely to have a broader range of taxable products and could therefore include both foods that fall into a discretionary food category and foods that contribute to a healthy diet. The impact a tax will have on

purchases and consumption (as measured by price elasticity) is affected by substitution; the consumer response to a tax-induced price increase is greater if close substitutes are available and untaxed. These close substitutes should be healthier to minimize substitution to similarly less healthy (and untaxed) foods.

The tax rate should be sufficiently high to deter consumption. The effect of the tax on outcomes of interest is likely to be larger if the tax rate is higher. Based on current evidence, the estimated percentage reduction in consumer purchases of SSBs in response to a price increase is about 1.6 times the percentage of the price increase.

Countries can structure a tax in different ways. It is beyond the scope of this guideline to describe different tax types in detail, but information is available elsewhere (2, 5). The evidence for this guideline included all tax types, although some are designed with the primary purpose of raising revenue. From a public health perspective, specific excise taxes, which raise the price of taxed products relative to other goods and services in the economy and are visible to the consumer are likely to be the most effective tax type to influence consumer behaviour (2, 5, 37, 38).

The extent to which cross-border shopping may occur is likely to depend on the geographical jurisdiction; greater attention should be paid to monitoring any such activity in smaller jurisdictions (39). It is important to note that experience from tobacco taxation indicates that non-price factors such as governance status, weak regulatory frameworks, and the availability of informal distribution networks appear to be far more important factors than price and tax differentials between jurisdictions (40). Regional and international cooperation offer opportunities to minimize cross-border shopping (5).

Before implementation of policies, countries should consider the resources required, and the existing governmental infrastructure and taxation mechanism (29). For taxes, factors such as the taxable products, tax base, and tax structure may influence the level of resources required. The resources required for subsidies are likely to be greater than for taxes.

A multitude of factors influence the acceptability of a fiscal policy, which varies by actor. For example, public acceptability of taxes increases if the revenue is used for health or social programmes (29). Overall, acceptability of a tax may increase over time. Initial opposition, however, is to be expected, which policy-makers need to be prepared for. Such opposition can be overcome with a broad coalition of supporters (e.g. community leaders, health organizations, grassroots organizations), and sufficient resources and ability to respond to industry arguments (36, 37, 41). The WHO manual on SSB taxation

policies discusses the political economy of SSB taxation and offers insights into tactics commonly used by industry actors and proposes strategies to support the adoption of an SSB tax and counter industry opposition (5).

Countries may be concerned about the possible financial regressivity of a tax, but this possibility must be weighed against the health benefits, which are likely to be greatest for the most vulnerable population groups, which tend to decrease consumption of taxed products by a greater extent and thus reap greater health-benefits. Tax revenue (without being dependent on it) can also be used for social protection interventions and interventions targeting vulnerable populations.

Successful implementation of fiscal policies to promote healthy diets in all regions suggests that implementation of such policies is feasible.

Research gaps

Based on the evidence considered in the guideline development process, several research gaps and considerations were identified, which will play an important role when updating the guideline, and in further advocacy and action to implement fiscal policies to promote healthy diets. Gaps identified reflect understudied thematic areas (e.g. effect of a tax on substitution or the effect of pricing policies) and geographic locations (e.g. research in LMICs), as well as methodological issues (e.g. related to the inconsistency or indirectness of results).

1 Introduction

1.1 Background

Good nutrition is key to ensuring optimal growth, health and well-being during childhood and beyond (42-45). Healthy dietary practices – the foundation for good nutrition – are initiated early in life. They also have long-term health impacts, including preventing noncommunicable diseases (NCDs) later in life. As well, they have an intergenerational impact through ensuring that mothers, particularly those who are adolescent girls, have an optimal nutritional status (42, 46, 47).

Unhealthy diets are a leading global public health risk, contributing to a rise in unhealthy weight gain and NCDs, including diabetes, heart disease, stroke and cancer (6, 7). NCDs now account for about 70% of all deaths globally (48). The dietary risks cluster¹³ results in 7.9 million deaths from NCDs per year and is responsible for 11.6% of all disability-adjusted life years (DALYs) lost to NCDs (49). Overweight and obesity in childhood is one of the most prominent global public health challenges today. Virtually no progress has been made in reducing the spread of overweight in two decades (50). Globally, 38.9 million children under the age of 5 years are estimated to have overweight – 41% of whom live in low- and lower-middle-income countries (50) – while 337 million children in the age group 5–19 years were estimated to have overweight or obesity in 2016 (7). At the same time, 45.4 million children under 5 years of age are wasted, and 149.2 million are stunted (50). The burden of malnutrition (i.e. undernutrition, including micronutrient deficiencies, and overweight) threatens the survival, growth and development of children and adolescents, as well as economies and nations (51).

Every country in the world is affected by one or more forms of malnutrition, and combating malnutrition in all its forms is considered one of the greatest global health challenges (52, 53). The causes of malnutrition are complex, and action is required on many fronts (54-57). In current food environments, energy-dense, nutrient-poor foods are readily available, relatively cheap and heavily marketed (58). As such, there is wide recognition that structural changes (i.e. changes to social, cultural, political and physical environments) are required to promote healthy diets (59). In the absence of these structural changes, behaviour change interventions on their own have had limited success in reducing disease risk factors (60). In line with the work of the World Health Organization (WHO) on creating supportive environments for health (61-63), key actions to improve diets include those that focus on the food environment – that is, the surroundings that influence and shape

¹³ The “dietary risks cluster” includes diets that are low in whole grains, fruit, nuts and seeds, vegetables, fibre, legumes, polyunsaturated fatty acids, calcium or milk, and/or are high in sodium, *trans*-fatty acids, processed meat, red meat or sugary drinks (Global Burden of Disease risk factors).

consumers' food behaviours, preferences and values, and prompt consumer decisions (64). The importance of environments in shaping behaviours was recently reinforced by the Director-General of WHO, in mentioning the importance of environments that “support, rather than block, behaviours that improve health” (65).

Governments play a leading role in addressing malnutrition in all its forms and reducing the burden of diet-related NCDs, including through public policies that create and protect food environments conducive to healthy diets (8-10) and through effective regulation of private sector activities that influence health (i.e. the commercial determinants of health) (63, 66). Public policies that create supportive environments to enable people to lead healthy lives have long been considered a central part of government action (67), as most recently reiterated in the Geneva Charter for Well-being (63). They are underpinned by human rights principles, and are characterized by an explicit concern for health and equity, and an accountability for health impact (67).

The food environment comprises the food supply and how foods are packaged, labelled, marketed and provided or sold. Affordability of food (which is a function of food price and disposable income) is a key element of the food environment and is well established as an important influence on food purchases (11), with consistent evidence that food purchases and consumption are inversely related to food price (14). The actions of agribusinesses, manufacturers and retailers are increasingly influencing food prices and affordability – as well as availability, safety and desirability – and, in current food systems, it has become challenging for consumers “to make healthy and affordable food choices consistent with optimal nutrition outcomes” (68). Although the cost of a healthy diet differs across major world regions and World Bank income groupings (12), a healthy diet that reflects global guidance¹⁴ is currently unaffordable for almost 3.1 billion people (13). At the same time unhealthier options, such as sugar-sweetened beverages (SSBs) (69), have become increasingly affordable. The inverse relationship between food prices and purchases and consumption indicates that taxes reduce, and subsidies increase, consumption of targeted foods (14).

Recognizing the impact of food prices and affordability, numerous global and regional calls to action have been made. Fiscal measures to promote health and prevent disease are broad ranging and have been proposed in various WHO documents adopted by the World Health Assembly, including the Global Strategy on Diet, Physical Activity and Health (15) in 2004, the Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition (16) in 2012, and the Global Action Plan for the

¹⁴ In this analysis, a “healthy diet” was based on average food group amounts recommended by food-based dietary guidelines from 10 countries.

Prevention and Control of Noncommunicable Diseases 2013–2020¹⁵ (17) in 2013. The Framework for Action to guide implementation of the commitments of the Rome Declaration on Nutrition adopted by the Second International Conference on Nutrition in 2014 also recommends that governments explore the use of economic incentives and disincentives to promote healthy diets (8). In 2018, the Political Declaration of the Third High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases (A/RES/73/2), endorsed by heads of state at the 73rd session of the UNGA, reaffirmed political commitment to “promote and implement policy, legislative and regulatory measures, including fiscal measures as appropriate, aiming at minimizing the impact of the main risk factors for non-communicable diseases, and promote healthy diets and lifestyles” (70).

1.2 Scope and purpose

In recent years, an increasing number of countries have implemented fiscal policies to promote healthy diets (18, 19). In particular, governments have imposed taxes on SSBs (4, 18, 19, 37, 71); as of 2022, 85 countries¹⁶ implemented SSB taxes at a national level, and three countries at a subnational or municipal level (**Fig. 1**), while 29 countries¹⁷ implemented national level taxes on less healthy food products. However, fewer countries have implemented policies to subsidize healthier foods and beverages,¹⁸ or remove taxes on healthier food products¹⁹ or remove subsidies on less healthy food products²⁰ as a means of encouraging healthier dietary patterns (18). Despite some progress in implementing fiscal policies to promote healthy diets, governments continue to face challenges in their attempts to develop fiscal policies, often resulting in weakened, delayed or defeated policies. Existing fiscal policies also vary in their policy design. For example, taxes on SSBs may exclude 100% fruit juices and milk-based SSBs from the taxable products, while others are based only on added sugars content and not on free sugars²¹ content (18).

¹⁵ 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.

¹⁶ Based on data from the WHO Global database on the Implementation of Nutrition Action (GINA) and the WHO Noncommunicable Disease Document Repository.

¹⁷ This number was collated by WHO from the WHO Global database on the Implementation of Nutrition Action (GINA) and the WHO Noncommunicable Disease Document Repository.

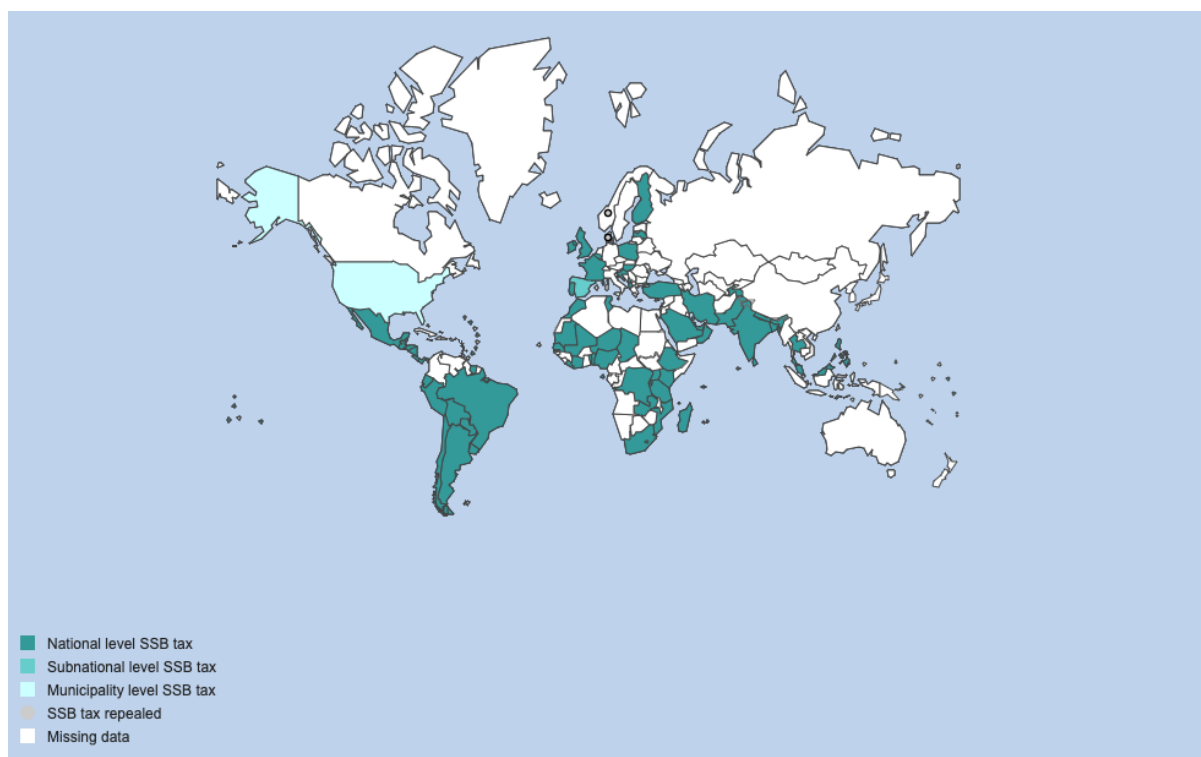
¹⁸ Subsidies on healthier foods and beverages were reported by nine countries in the WHO Global Nutrition Policy Review 2016–2017, of which four provided details.

¹⁹ Removing taxes from healthier foods and beverages was reported by six countries in the WHO Global Nutrition Policy Review 2016–2017, of which four provided details.

²⁰ Removing subsidies on foods and beverages that are inconsistent with a healthy diet was reported by four countries in the WHO Global Nutrition Policy Review 2016–2017, all of which provided details.

²¹ Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates (WHO *Guideline: sugars intake for adults and children*, 2015; http://www.who.int/nutrition/publications/guidelines/sugars_intake/en/).

Fig. 1. Countries with taxes on SSBs as of May 2022



Note: “Missing data” means there has either been no action to implement SSB taxes or the status is unknown.

In response to Member State requests, to provide evidence-based guidance, and to strengthen and streamline support for Member States in developing and implementing new, or strengthening existing, fiscal policies to effectively promote healthy diets, WHO began the process of developing this guideline.

Because no single intervention can ensure that all aspects of the food environment support healthy diets, a comprehensive package of policy actions is required. Therefore, guidelines are being developed for multiple policy actions in addition to fiscal and pricing policies, including policies to restrict food marketing, nutrition labelling policies, and school food and nutrition policies. Prioritization of policies will depend on country context.

Recognizing the broad range of fiscal and pricing measures governments can use for health promotion, the scope of this guideline is limited to taxation of foods and SSBs, and to a subset of food subsidies with the primary intention to change consumer behaviour by lowering prices of targeted foods at retail level. The guideline does not cover subsidies at the level of food production and agricultural subsidies (i.e. subsidies to manufacturers or farmers) or trade policy instruments (e.g. import tariffs).

School meal or food subsidies were not included. School food provision is reviewed in a forthcoming WHO guideline on school food and nutrition policies. Pricing policies are defined as enforceable legal measures taken by governments to restrict price promotions or implement minimum price policies (price floors) and maximum price policies (price ceilings). The guideline is intended for the general population (children and adults). It does not cover fiscal policies on foods for special dietary purposes, and patient groups with special dietary needs are therefore not a relevant target group. Finally, this guideline is not an implementation manual – it does not describe *how* countries can implement and monitor fiscal and pricing policies to promote healthy diets. Implementation guidance on SSB taxation policies can be found in the WHO manual on SSB taxation policies (5).

The WHO guidelines on policies to improve the food environment are in line with other WHO guidelines and recommendations, including guidelines on sodium intake (23) and sugars intake (24); forthcoming guidelines on total fat, saturated fatty acids and *trans*-fatty acids, polyunsaturated fatty acids, carbohydrates, use of non-sugar sweeteners and use of low-sodium salt substitutes; and the recommendations of the WHO Commission on Ending Childhood Obesity (25). The guidelines on policies to improve the food environment can be used in conjunction with available manuals (5) and tools, including the nutrient profile models developed by the WHO regional offices for regulating marketing of foods and non-alcoholic beverages to children (72-77).

1.3 Objectives

Complementing global and regional guidance on fiscal policies, and recognizing that there is a large body of evidence on the impacts of fiscal measures for health promotion, the objectives of this guideline are to:

- provide Member States with recommendations and implementation considerations, based on evidence specific to taxation of foods and SSBs and to a subset of food subsidies with the primary intention to change consumer behaviour by lowering prices of targeted foods;
- enable evidence-informed advocacy to advance action on fiscal policies to promote healthy diets;
- guide future research to further strengthen the evidence base for action on fiscal policies to promote healthy diets; and
- contribute to the creation of food environments that enable healthy dietary practices among children.

As noted above, this guideline is one of several on policies to improve the food environment. The overarching objective of the WHO guidelines on policies to improve the food environment is to contribute to the achievement of healthier populations, in line with the WHO Thirteenth General Programme of Work (2019–2023) (78). The guidelines will also contribute to implementation of a number of additional calls to action relating to nutrition and health, including:

- the Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition
- the Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020²²
- the Political Declaration of the High-level Meeting of the United Nations General Assembly on the Prevention and Control of NCDs held in New York in September 2011 and the outcome document (A/RES/68/300) of the High-level Meeting of the United Nations General Assembly on the Prevention and Control of NCDs held in New York in July 2014;
- the recommendations of the Commission on Ending Childhood Obesity established by the WHO Director-General in May 2014;
- the 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 commitments of the Rome Declaration on Nutrition across multiple sectors;
- the goals of the UN Decade of Action on Nutrition (2016–2025), declared by the UNGA 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;
- the acceleration plan to stop obesity adopted at the WHA75 in May 2022 together with the intermediate outcome and process targets; and
- the 2030 Agenda on Sustainable Development and the Sustainable Development Goals, particularly Goal 2 (“zero hunger”) and Goal 3.4 (“reduce by one third premature mortality from NCDs through prevention and treatment”).

²² 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.

1.4 Target audience

The guideline is intended for a wide audience involved in the development, design, implementation, monitoring and evaluation, and advocacy of fiscal policies to promote healthy diets. The end users for this guideline are thus:

- national and local policy-makers from health and finance/tax authorities and food regulators involved in developing, designing, implementing, monitoring or evaluating fiscal policies on foods and non-alcoholic beverages;
- implementers and managers of national and local health and nutrition programmes;
- organizations (including nongovernmental organizations) and professional societies involved in advocating for, developing and evaluating fiscal policies;
- health professionals, including managers of health and nutrition programmes and public health policy-makers in all settings;
- scientists and other academic actors involved in relevant research (including policy evaluation); and
- representatives of the food industry and other agencies involved in complying with and implementing fiscal policies.

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* (26). This section 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 with support from the Department of Health Promotion and other members of the WHO Secretariat (**Annex 1**), together with the contributors described below.

WHO Steering Committee

An internal steering committee (**Annex 2**) provided initial inputs 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 3**) – the WHO Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Policy Actions – was convened with the main functions of determining the scope and key questions 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 fiscal and pricing policies to promote healthy diets; and systematic review, programme evaluation and Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodologies.

External resource people

Various external resource people, including methods experts and members of the systematic review teams, attended the meetings of the NUGAG Subgroup on Policy Actions (**Annex 4**). The systematic review team was led by Dr Tatiana Andreyeva, University of Connecticut. It undertook a systematic

review to support development of the guideline; this was published as two peer-reviewed articles, on fiscal and pricing policies for non-alcoholic beverages (27) and for foods (28).

The risk of bias assessment team was led by Dr Beverley Shea, Ottawa Methods Centre, Ottawa Hospital Research Institute. The team applied different tools, as appropriate for the study designs, which included interrupted time-series, controlled before-and-after studies, cohort studies, mixed methods and RCTs (as detailed in section 2.2). This differed from the approach used in the two published articles, which used a tool developed by the systematic review team to capture validity of measures, sample selection and control for confounders.

External peer-review group

(To be added before finalization)

Public consultation

(To be added before finalization)

2.2 Guideline development process

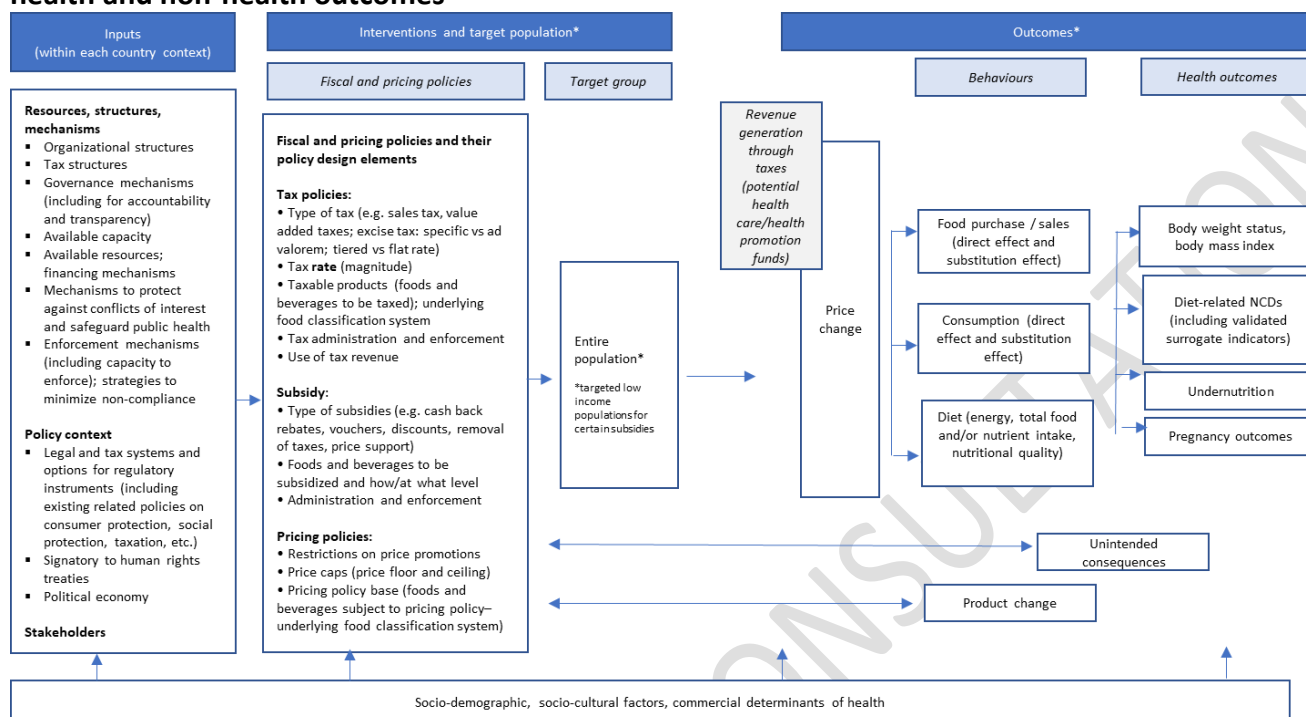
Scoping of the guideline

A scoping review of existing evidence was prepared by Dr Tatiana Andreyeva, University of Connecticut. The scoping review included a review of current evidence on the impacts of food and beverage prices on consumer demand for targeted products, dietary intake and quality, and body weight and health outcomes.

Formulation of key questions and prioritization of outcomes

Policy measures to promote healthy diets, including fiscal policies, 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 (26). **Fig. 2** shows a logic model depicting pathways from fiscal and pricing policies to promote healthy diets to behavioural, health and non-health outcomes. It indicates the complexity of such policies and the range of contextual factors that influence a policy's impact on the outcomes of interest.

Fig. 2. Logic model depicting pathways from fiscal and pricing policies to behavioural, health and non-health outcomes



* Interventions and outcomes shown in the figure are those prioritized by the members of the WHO Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Policy Actions in formulating the research question for the evidence review to inform the guideline on fiscal policies

Considering the scoping review and the logic model, a research question was formulated using the population, intervention, comparator and outcome (PICO) format. The draft PICO question was first discussed and reviewed by the WHO Secretariat, the WHO Steering Committee and the NUGAG Subgroup on Policy Actions. The final PICO question was determined by 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. These included that countries may have only recently introduced the interventions under consideration while changes to outcomes such as body weight and diet-related disease occur gradually, as well as the methodological challenges of disentangling the impact of fiscal and pricing policies from the complex array of factors that contribute to such outcomes and the need to be realistic about the extent to which any one intervention can be expected to impact these outcomes on its own. Nonetheless, the group ranked several longer-term health outcomes and two non-health outcomes as *important*, to ensure the breadth and depth of current evidence was 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 adults and children on priority outcomes of implementing a fiscal and/or pricing policy compared with not implementing the policy?

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

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

Measure	Key question
Population	Children and adults Disaggregation by age, sex, gender, BMI, pregnancy status, SES, rurality, region (HICs and LMICs)
Intervention	Measures taken by governments to tax specified foods and non-alcoholic beverages, to subsidize targeted foods or non-alcoholic beverages to change consumer behaviour by lowering prices of targeted foods at retail level, to restrict price promotions and/or implement minimum price policies (price floors) or maximum price policies (price ceilings) Disaggregation by type of tax, subsidy or pricing policy; tax or subsidy rate; products to be subject to a tax, subsidy or pricing policy; tax or subsidy point, jurisdiction and duration; use of tax revenue; and degree and quality of implementation and enforcement
Comparator	No fiscal or pricing policy
Critical outcomes for decision making	Price change Purchases: direct effects Purchases: substitution effects Consumption: direct effects Consumption: substitution effects Dietary intake
Important outcomes (longer-term health outcomes and non-health outcomes) ²³	Body weight status Diet-related NCDs Undernutrition and pregnancy outcomes Product changes Unintended consequences

²³ The guideline development group ranked longer term health outcomes and two non-health outcomes as *important*, to ensure the breadth and depth of current evidence is captured and considered in this guideline and to highlight potential research and knowledge gaps and data challenges to strengthen the evidence base for future updates to this guideline.

BMI: body mass index; HIC: high-income country; LMIC: low- and middle-income country; NCD: noncommunicable disease; SES: socioeconomic status.

A systematic review was commissioned to assess the evidence on the effectiveness of implemented policies, including determining their potential desirable and undesirable effects, and exploring policy design elements, because none of the identified reviews adequately answered the formulated research question.

The NUGAG Subgroup on Policy Actions requested an additional review to provide contextual information relevant to implementation of fiscal and pricing policies to promote healthy diets. The contextual factors in the review included those outlined in the *WHO handbook for guideline development* (Chapters 10 and 18) (26) and reflect elements of the logic model. The inputs – for example, human and financial resources, and the policy context – impact the feasibility and acceptability of the intervention. Additional questions were formulated to guide the review of contextual factors (**Table 2**).

Table 2. 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 terms, and the impact on government revenue (including the use of additional revenue; and issues of noncompliance, inflation, black market or cross-border trade)?
Equity	<p>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)?</p> <p>Is the intervention sensitive to sex, age, ethnicity, religion, culture, language, sexual orientation/gender identity, disability status,</p>

	education, SES, 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)?

SES: socioeconomic status.

Pricing policies were considered in scope for both the systematic review and the review of contextual factors. However, no recommendations were formulated for pricing policies to promote healthy diets because of a lack of evidence relating to their effectiveness (or harms); the title of this guideline hence refers only to fiscal policies to promote healthy diets.

Evidence gathering and grading

Evidence gathered for this guideline included:

- a systematic review on the impacts of fiscal and pricing policies on non-alcoholic beverages (27) and foods (28);
- a review of contextual factors (values, resource implications, equity and human rights, acceptability, and feasibility) (29); and
- modelling studies on taxation of food.

The systematic review team conducted the systematic review to address the key question in PICO format (**Table 1**). The review of contextual factors was conducted by WHO (29). Detailed descriptions of the methods for each review are available in the review publications.

The risk of bias of each study included in the systematic review was assessed by the risk of bias assessment team using the following standardized tools:

- Cochrane Effective Practice and Organisation of Care Review Group data collection checklist for interrupted time-series and controlled before-and-after studies
- Newcastle–Ottawa Quality Assessment Form for Cohort Studies for cohort studies
- Mixed Methods Appraisal Tool
- Cochrane Risk of Bias 2 (RoB 2) tool for RCTs.

In line with the guideline development process, the certainty of the body of evidence for each outcome gathered through the systematic review was assessed using the GRADE approach. The GRADE approach for assessing the level of certainty in the evidence provides a transparent approach to grading the certainty of evidence for each outcome included in key questions. The certainty of evidence indicates the level of confidence that the effects of an intervention as 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: 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 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) (30). The starting point for

assessing the overall certainty of the evidence for an outcome depends on the design of the studies that contribute to the evidence base: evidence from observational studies starts at low certainty, because of residual confounding, while evidence from RCTs starts at high certainty. Most studies that assess the effectiveness of a fiscal policy are observational, which means 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 of the evidence (risk of bias, inconsistency, indirectness, imprecision and publication bias) and three factors for potentially upgrading the certainty of the evidence (large effect size, all plausible confounding would reduce the demonstrated effect, and dose–response gradient).

For each GRADE factor, judgements were made in consultation with the methods expert, and further discussed with the systematic review authors and the NUGAG Subgroup on Policy Actions. The judgements, and their rationale, were recorded in GRADE evidence profile tables (**Annex 6**).

The certainty of evidence was not assessed for the review of contextual factors (29), nor for the modelling studies on taxation of food.

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 rating the certainty of evidence for each critical and important outcome, the guideline development group made a judgement on the overall certainty of evidence by reflecting on the validity, precision, consistency, and applicability of the measures of effect and taking the pathway of effect of the entire body of evidence into consideration. The GRADE approach makes an explicit separation of the process for assessing the level of certainty in the evidence from the process for making recommendations. The latter process takes a number of additional contextual factors into consideration (resource implications, equity and human rights, acceptability and feasibility) (30). The level of certainty of evidence does not imply a particular strength of recommendation; high certainty evidence does *not* necessarily mean 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, and anonymous online voting was used to arrive at an initial judgement for each factor (**Annex 7**). 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 the recommendations and associated remarks by consensus.

2.3 Management of conflicts of interest

According to the rules in the WHO *Basic documents* (79), 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 analysed. 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. Declaration of interest forms were reviewed by the WHO Secretariat in consultation with the WHO Office of Compliance, Risk Management and Ethics when finalizing the composition of the NUGAG Subgroup on Policy Actions. 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 the distribution of the declaration of interest form, the WHO Secretariat described the declaration of interest process and provided an opportunity during the meeting 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. The procedures for management of interests outlined in the *Guidelines for declaration of interests (WHO experts)* (31) were strictly followed.

Similarly, declaration of interest forms from external peer reviewers were assessed by the WHO Secretariat, also following the procedures for management of interests outlined in the *Guidelines for declaration of interests (WHO experts)* (31).

3 Summary of evidence

3.1 Evidence on effectiveness of fiscal policies to promote healthy diets

The evidence summarized in this section is from the systematic review on the effect of fiscal and pricing policies to promote healthy diets (which was published as two peer-reviewed articles, on fiscal and pricing policies for non-alcoholic beverages (27) and for foods (28)) and from the GRADE evidence profiles (Annex 6).

Table 1 outlines the population, intervention, comparator and outcomes that guided the review. Policies that could affect consumer prices but are not direct fiscal or pricing policies, such as import tariffs, agricultural subsidies, cash transfers and in-kind transfer programmes, were not included. Pilot interventions were included if the piloted intervention was later adopted into policy.

The included studies were grouped as follows:

- taxation of SSBs²⁴ ($n = 86$ studies);
- taxation of foods or nutrients ($n = 19$ ²⁵)
 - tax on food ($n = 15$)
 - tax on saturated fat ($n = 5$); and
- subsidies on foods that contribute to a healthy diet ($n = 32$ ²⁶).

No eligible studies were identified for pricing policies.

²⁴ The taxable products varied across evaluated tax policies. Beverages included both those sweetened with non-sugar sweeteners and SSBs (i.e. beverages containing free sugars – that is, monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates). They include carbonated or non-carbonated soft drinks, fruit/vegetable juices and drinks, liquid and powder concentrates, flavoured water, energy and sports drinks, ready-to-drink tea, ready-to-drink coffee, and flavoured milk drinks. Evaluations were conducted on all taxed beverages combined; it was not possible to conduct separate analyses by type of beverage.

²⁵ The number of studies reporting on taxation of foods or nutrients (19) is less than the sum of the number of studies reporting on taxation of food (15) and taxation of saturated fat (5), as one study reported on both taxes on food (in Hungary, Denmark and Finland) and a tax on saturated fat (in Denmark).

²⁶ The systematic review on the effect of food subsidies (28) included an additional three studies that evaluated a price incentive programme implemented by a private health insurance in South Africa. This programme was not included in evidence base for this guideline. It was not considered a subsidy, since the programme did not directly involve government funds.

3.1.1 Taxation of SSBs

A total of 86 studies, all observational,²⁷ on 11 national²⁸ and 14 subnational²⁹ taxes on SSBs were included in the systematic review.

The evaluated taxes on SSBs included in the review varied in their type (e.g. excise or sales, tiered or uniform), coverage (national or subnational), taxable products (beverages included or not included) and rate. The range of tax rates within the review was 5–50%, with most studies looking at tax rates within the range of 10–25%. However, price increases were often lower than the tax rates cited, due to incomplete pass-through of taxes, as explained below. Characteristics of the tax policies are summarized in **Annex 8**.

Pooled analyses were completed for five of the six critical outcomes – price change, purchases: direct effects, purchases: substitution effects, consumption: direct effects, consumption: substitution effects – and none of the six important outcomes. Hartung–Knapp-adjusted three-level random-effects models were used to generate pooled estimates, given that a high heterogeneity of effects was expected and that studies were nested within taxing jurisdictions. Where possible, sensitivity analyses assessed the possible impact of outliers, studies with high and low variance, and risk of bias³⁰ on the effect sizes. Studies that could not be included in pooled analyses (e.g. due to missing data or a lack of statistical testing) were synthesized narratively. For outcomes where pooled analyses were not completed, narrative synthesis was used for all studies.

Where possible, subgroup analyses compared findings based on socioeconomic status (SES) using narrative synthesis. It was not possible to complete subgroup analyses by age, sex, gender, body mass index (BMI), pregnancy status, rurality or region (high-income countries (HICs) and LMICs) or by any tax characteristics, due to lack of data.

Based on the included studies, observational evidence found that taxes on SSBs increase prices of taxed beverages (**Annex 6**). Due to the large effect size for price change of taxed beverages (measured using the pass-through rate), the observational evidence was upgraded from low to moderate certainty. The effects of taxes on SSBs on prices of taxed beverages were reported as pass-through rates (the rate of an excise tax that is transferred from producers and/or distributors to consumers).

²⁷ All included studies used non-experimental research designs, including interrupted time-series or controlled before-and-after designs (i.e. difference-in-difference analysis).

²⁸ National taxes: Barbados, Chile, Denmark, Finland, France, Hungary, Mexico, Portugal, Saudi Arabia, South Africa, United Kingdom.

²⁹ Subnational taxes: Berkeley (USA), Boulder (USA), Cook County (USA), Maine (USA), Oakland (USA), Ohio (USA), Philadelphia (USA), San Francisco (USA), Seattle (USA), Washington (USA), Catalonia (Spain), Sheffield (United Kingdom), restaurant chain (United Kingdom), state sales taxes (USA).

³⁰ The sensitivity analysis by risk of bias included in this summary of evidence and the GRADE evidence profile tables (**Annex 7**) is based on the risk of bias assessed by the risk of bias assessment team.

Pooled analysis of 46 estimates from 41 studies for 18 policies³¹ found a pass-through rate of 82% (95% confidence interval (CI): 66% to 98%; $P < 0.001$), indicating that a one dollar increase in tax would increase the price for the consumer by 0.82 dollars, suggesting an incomplete pass-through and tax undershifting. There were no substantive differences in the magnitude or statistical significance of the effect size when outlier studies were excluded, and no significant difference in effect size between studies with low and high risk of bias. Of 12 estimates from eight studies for 10³² policies that could not be included in the pooled analysis, 10 estimates (from seven studies) suggested increased prices of taxed beverages but did not provide statistical testing. The remaining two estimates were from a study of two state sales taxes in the United States of America (USA) – the study showed significantly increased prices of taxed beverages in one state and no significant change in the other.

Observational evidence found that taxes on SSBs reduce purchases of taxed beverages (a measure of direct effects) (**Annex 6**). Due to the large effect size for purchases of taxed beverages (measured using price elasticity), the observational evidence was upgraded from low to moderate. Pooled analysis of 35 estimates from 33 studies for 16 policies³³ found an own price elasticity of -1.59 (95% CI: -2.11 to -1.08 ; $P < 0.001$), indicating that a 10% tax-induced price increase would reduce purchases by about 16%. There were no substantive differences in the magnitude or statistical significance of the effect size when outlier studies or studies with extreme variance were excluded, and no significant difference in effect size between studies with low and high risk of bias. Of 14 estimates from 10 studies for 10³⁴ policies that could not be included in the pooled analysis, nine estimates (from six studies) suggested decreased purchases of taxed beverages but did not provide statistical testing, three estimates (from three studies) showed significantly decreased purchases of taxed beverages, and two estimates (from one study) showed no significant change. In a narrative subgroup analysis of purchases of taxed beverages by SES, six studies from Mexico consistently showed greater reductions in purchases of taxed beverages for low-income (compared with higher-income) or low-SES (compared with higher-SES) households. The results of studies from other countries were less consistent. Of two studies from Philadelphia, USA, one study showed no difference by SES or income, whereas the other study showed lower reductions in purchases of taxed beverages in low-income residential areas. Two studies from Chile and two studies from Catalonia, Spain, showed greater reductions in purchases of taxed beverages in higher-income groups or areas, and a United Kingdom

³¹ Barbados, Chile, Denmark, France, Mexico, Saudi Arabia, South Africa, United Kingdom, Portugal, Catalonia (Spain), Berkeley (USA), Philadelphia (USA), Boulder (USA), Oakland (USA), San Francisco (USA), Cook County (USA), Seattle (USA), Washington (USA).

³² Denmark, Finland, France, Hungary, Mexico, Portugal, Catalonia (Spain), Maine (USA), Ohio (USA), Philadelphia (USA).

³³ Barbados, Chile, Denmark, France, Mexico, Portugal, Saudi Arabia, Catalonia (Spain), Berkeley (USA), Cook County (USA), Oakland (USA), Philadelphia (USA), Seattle (USA), Washington (USA), Sheffield (United Kingdom), restaurant chain (United Kingdom).

³⁴ Denmark, Finland, France, Hungary, Mexico, Portugal, United Kingdom, Maine (USA), Ohio (USA), Philadelphia (USA).

study found that the reduction in sugar purchased per household from taxed beverages was smallest for the lowest SES group.

Observational evidence about the effect of taxes on SSBs on purchases of untaxed beverages (a measure of substitution effects) (**Annex 6**) was very low certainty. Pooled analysis of 25 estimates from 24 studies for 14³⁵ policies found a price elasticity of 0.42 (95% CI: -0.52 to 1.35; $P = 0.37$), indicating no significant substitution to untaxed beverages. There were no substantive differences in the magnitude or statistical significance of the effect size when outlier studies or studies with extreme variance were excluded, and no significant difference in effect size between studies with low and high risk of bias. Of eight studies for six³⁶ tax policies that could not be included in the pooled analysis, two studies showed no significant change in purchases of untaxed beverages, two studies suggested no change in purchases of untaxed beverages but did not provide statistical testing, two studies suggested increased purchases of untaxed beverages but did not provide statistical testing, one study showed significantly increased purchases of untaxed beverages, and one study suggested mixed results across retailers. In a narrative subgroup analysis of purchases of untaxed beverages by SES, findings were inconsistent.

Observational evidence about the effect of taxes on SSBs on self-reported consumption of taxed beverages (a measure of direct effects) was very low certainty (**Annex 6**). Pooled analysis of 12 estimates from nine studies for five³⁷ policies found a price elasticity of -3.78 (95% CI: -8.86 to 1.30; $P = 0.13$), suggesting no significant effect of taxes on SSBs on self-reported consumption of taxed beverages. Of four studies for two³⁸ policies that could not be included in the pooled analysis, two studies assessing the impact of an excise tax showed significantly decreased self-reported consumption of taxed beverages, and two studies on a subnational sales tax in the USA showed no significant change. In a narrative subgroup analysis of self-reported consumption of taxed beverages by SES, a study from Philadelphia, USA, and a study from Mexico showed no difference by income.

Similarly observational evidence about the effect of taxes on SSBs on self-reported consumption of untaxed beverages (a measure of substitution effects) was very low certainty (**Annex 6**). Pooled analysis of 12 estimates from nine studies for five³⁹ policies found a price elasticity of 0.54 (95% CI: -0.60 to 1.68; $P = 0.32$), indicating no significant substitution to untaxed beverages. There were no substantive differences in the magnitude or statistical significance of the effect size when outlier

³⁵ National: Barbados, Chile, Denmark, France, Mexico, United Kingdom; subnational: Catalonia (Spain), restaurant chain (United Kingdom), Philadelphia (USA), Oakland (USA), Cook County (USA), Seattle (USA), Berkeley (USA), Washington (USA).

³⁶ Denmark, Mexico, Saudi Arabia, United Kingdom, Berkeley (USA), Philadelphia (USA).

³⁷ Catalonia (Spain), Berkeley (USA), Oakland (USA), Philadelphia (USA), Seattle (USA).

³⁸ Mexico, state sales taxes (USA).

³⁹ Catalonia (Spain), Berkeley (USA), Oakland (USA), Philadelphia (USA), Seattle (USA).

studies were excluded, and no significant difference in effect size between studies with low and high risk of bias. Of two studies for one⁴⁰ policy that could not be included in the pooled analysis, one study showed significantly increased self-reported consumption of untaxed beverages, and one study showed mixed results by type of beverage.

Observational evidence about the effect of taxes on SSBs on diet was very low certainty (**Annex 6**). Pooled analysis was not possible. Of the two studies that reported on the diet outcome, both of which reported on state sales taxes in the USA, one study showed no change in total calorie intake and the other study significantly increased total calorie intake.

Observational evidence about the effect of taxes on SSBs on product changes was of low certainty (**Annex 6**). Pooled analysis was not possible. Of the six studies that reported on the outcome of product changes, which were related to three specific tiered excise taxes⁴¹ in Portugal, South Africa and the United Kingdom, five studies suggested decreased sugar content of taxed beverages but did not provide statistical testing. The remaining study, from the United Kingdom, did provide statistical testing and found a significant reduction in the percentage of beverages exceeding the lower levy threshold for sugar.

With regard to unintended consequences, the evidence about the effect of taxes on SSBs on unemployment was very low certainty, and evidence on the effect on cross-border shopping and other unintended consequences was low certainty (**Annex 6**). Pooled analyses were not possible. One study from Mexico showed no change in manufacturing jobs and a significant decrease in national unemployment rates, whereas a study from Philadelphia, USA, showed no significant effect on unemployment. Results for cross-border shopping after implementation of a tax in small jurisdictions showed mixed results. Of 10 studies for five excise tax policies in local jurisdictions, four studies showed significantly increased cross-border shopping or significantly decreased total grocery sales for retailers in taxed jurisdictions, three studies suggested effects but did not provide statistical testing, two studies suggested mixed results, and one study showed no significant effect. With regard to other unintended consequences, two United Kingdom studies showed no significant post-tax changes for market return and turnover for soft drink manufacturers. A study in Oakland, USA, showed no significant changes to store SSB advertising and price promotions after tax implementation.

The observational evidence about the effect of taxes on SSBs on body weight status was from studies that reported on state sales taxes in the USA and was low certainty (**Annex 6**). Pooled analysis was not possible. Only one of the five studies that reported on this outcome, showed significantly decreased

⁴⁰ State sales taxes (USA).

⁴¹ See Glossary for a definition of tiered taxes.

BMI. The remaining four studies reported no significant difference. In a narrative subgroup analysis of body weight status by SES, one USA study reported larger effects among individuals with higher levels of education (compared with individuals with lower levels of education).

No eligible studies were identified for the outcomes of diet-related NCDs, undernutrition or pregnancy outcomes.

Limitations of the evidence include few or no studies on long term outcomes such as body weight status and diet-related NCDs; most taxes on SSBs are recently implemented, however, and changes in these outcomes typically occur gradually over time. In many cases, studies reported only aggregated results for the general population, with no results by SES, limiting assessment of the impacts of taxes on equity.

3.1.2 Taxation of foods or nutrients

A total of 19 studies, all observational,⁴² on four national taxes⁴³ and three state sales taxes in the USA⁴⁴ on foods or nutrients were included.

The evaluated taxes on food included in this review varied in their type (e.g. excise, sales), coverage (national or subnational), taxable products (foods included) and rate. Details of the tax policies can be found in **Annex 8**. Because of the variation in tax policy design, the effects of taxes on foods were analysed and summarized separately in the following categories:

- taxation of foods (10 studies on a national excise tax in Mexico; one study on a national excise tax in Hungary; one study on national excise taxes in Hungary, Denmark and Finland; and three studies on state sales taxes in the USA); and
- taxation of saturated fats (five studies on a national excise tax in Denmark).

Pooled analysis could not be completed for any of the outcomes of interest, because of the low number of available studies or high heterogeneity across measures. Instead, all studies were synthesized narratively.

⁴² All included studies used non-experimental research designs, including interrupted time-series or a before-and-after controlled design (i.e. difference-in-difference analysis).

⁴³ Denmark, Finland, Hungary, Mexico.

⁴⁴ Colorado (USA), Maine (USA), state sales taxes (USA).

Tax on foods

Fifteen studies on four national taxes (Denmark, Finland, Hungary and Mexico) and three subnational taxes (Colorado (USA), Maine (USA) and state sales taxes in the USA) on foods were included.

Four of the six observational studies on the effect of taxes on foods on price change showed significantly increased prices of taxed foods. The remaining two studies (on the Mexican tax and on taxes in Denmark, Finland and Hungary) suggested increased prices of taxed foods, but did not provide statistical testing. The evidence for this outcome was of very low certainty (**Annex 6**).

Of nine observational studies that reported on the effect of taxes on foods on purchases of taxed foods (a measure of direct effects), five studies (on the Mexican and Hungarian taxes) showed significantly decreased purchases of taxed foods, one study (on taxes in Denmark, Finland and Hungary) suggested decreased purchases of taxed foods but did not provide statistical testing, two studies (on the Mexican tax and on a sales tax in Colorado, USA) reported no significant change, and one study (on the Mexican tax) found mixed results by food. The evidence for this outcome was of very low certainty (**Annex 6**). In a narrative subgroup analysis of purchases of taxed foods by SES, two studies on the Mexican tax suggested that purchases of taxed foods declined more for low-SES households (compared with higher-SES households).

Observational evidence about the effect of taxes on foods on purchases of untaxed foods (a measure of substitution effects) was very low certainty (**Annex 6**). Of seven studies that reported on this outcome, two studies (on the Mexican tax and on a sales tax in Colorado, USA) showed significantly increased purchases of untaxed foods, two studies (on the Mexican tax) found mixed results, and three studies (on the Mexican and Hungarian taxes) showed no significant change.

With regard to unintended consequences, evidence about the effect of taxes on foods on unemployment was very low certainty (**Annex 6**). Two studies, both on the Mexican tax, reported on unemployment. One case study reported an increase in unemployment but did not provide statistical testing. The other study showed a small but significant decrease in national unemployment following tax implementation.

The observational evidence about the effect of a food tax BMI was from studies that reported on sales taxes in two States in the USA and was low certainty (**Annex 6**). Pooled analysis was not possible. Of the two studies that reported on this outcome, neither study reported a significant impact. In a narrative subgroup analysis of body weight status by SES, one study found a negative association between taxes and BMI for high-school graduates only.

No studies were identified for the outcomes of consumption of taxed foods (a measure of direct effects), consumption of untaxed foods (a measure of substitution effects), dietary intake, product changes, diet-related NCDs, undernutrition or pregnancy outcomes.

The systematic review included only real-world policy evaluations, of which there were a limited number. Evidence from modelling studies was therefore also considered by the NUGAG Subgroup on Policy Actions, which shows that that food taxes – if well designed – are expected to have a desirable and large effect on health outcomes (32-35).

Tax on saturated fats

Five studies on a national tax on saturated fats in Denmark were included. The national tax had a very broad range of taxable products, including taxes on core foods. The available evidence was of very low certainty, and was mostly downgraded due to risk of bias and indirectness, as evidence was from one setting, representing a single country context (**Annex 6**).

Of three studies reporting on the effect of taxes on saturated fats on the price of taxed foods, two studies showed significantly increased prices of taxed foods. The remaining study suggested increased prices of taxed foods but did not provide statistical testing.

Of five studies that reported on the effect on purchases of taxed foods, three studies suggested decreased purchases of taxed foods but did not provide statistical testing, and two studies showed significantly decreased purchases of taxed foods.

Only one study reported on the effect on purchases of untaxed foods. It suggested mixed results but did not provide statistical testing.

No studies were identified for the outcomes of consumption of taxed foods (a measure of direct effects), consumption of untaxed foods (a measure of substitution effects), diet, product changes, unintended consequences, body weight status, diet-related NCDs, undernutrition or pregnancy outcomes.

3.1.3 Subsidies on foods that contribute to a healthy diet

A total of 32 studies, 10 of which were RCTs and 22 observational studies, on a subset of subsidies on targeted foods that contribute to a healthy diet were included. More specifically, studies evaluated various vouchers for and discounts on fruit and vegetables for low-income households in the US; food vouchers for low-income pregnant women and low-income households in the UK; a subsidised fruit and vegetable box programme targeting low-income Aboriginal families with young children in

Australia; discounted pulses and fortified wheat flour for eligible households in India; and the reduction of value-added tax (VAT) on fruits and vegetables in Latvia. Subsidies also varied in their coverage (national or subnational/state), in terms of included products to be subsidized and target population. Details of the subsidy policies can be found in **Annex 8**.

Pooled analyses were completed for two of the six critical outcomes – purchases of subsidized fruits and vegetables (a measure of direct effects) and consumption of subsidized fruits and vegetables (a measure of direct effects) – and none of the six important outcomes. Hartung–Knapp-adjusted three-level random-effects models were used to generate pooled estimates, given that a high heterogeneity of effects was expected and multiple estimates per study were available. Studies that could not be included in pooled analyses (e.g. due to missing data or a lack of statistical testing) were synthesized narratively. For outcomes where pooled analyses were not completed, narrative synthesis was used for all studies. Evidence from both RCTs and observational studies was very low certainty for all outcomes for which studies were identified, with details provided in **Annex 6**.

Three observational studies that reported about the effect of subsidies on foods that contribute to a healthy diet on price change. One of the three (from Latvia, which assessed a VAT rate reduction) showed significantly decreased price indices for some fruits and vegetables in Latvia compared with controls. The two remaining studies, from the USA, had mixed results across measures.

Pooled analysis of eight estimates on purchases of subsidized fruits and vegetables from six RCTs found a price elasticity of -0.79 (95% CI: -1.60 to 0.02 ; $P = 0.05$), indicating that a 10% subsidy-induced price decrease would increase purchases significantly by about 7.9%. Pooled analysis of six estimates from four observational studies found a price elasticity of -0.34 (95% CI: -0.74 to 0.05 ; $P = 0.08$). All four studies (one RCT and three observational studies) that could not be included in the pooled analyses, showed significantly increased purchases of subsidized fruits and vegetables.

Of the three studies (two RCTs and one observational study) that reported on purchases of unsubsidized foods, two studies showed no significant change, and one study found mixed results.

Pooled analysis of four estimates on consumption of subsidized fruits and vegetables from three RCTs found a price elasticity of -0.45 (95% CI: -1.50 to 0.59 ; $P = 0.26$), indicating no significant effect, and pooled analysis of five estimates from four observational studies found a price elasticity of -0.02 (95% CI: -0.20 to 0.15 ; $P = 0.72$), also indicating no significant effect. Of the 10 studies (two RCTs and 8 observational studies) that could not be included in the pooled analyses, six studies showed significantly increased consumption of subsidized fruits and vegetables, and four studies showed no significant change.

Of the four studies (three RCTs and one observational study) that reported on consumption of unsubsidized foods, three studies found mixed results, and one showed significantly decreased consumption of unsubsidized foods.

Of the five studies (three RCTs and two observational studies) that reported on diet, an observational study from India showed significantly increased intake of protein from pulses, and an RCT from the USA showed a significantly increased Healthy Eating Index-2010 score. Of the remaining studies, two studies showed no significant effect, and one study found mixed results.

The two studies (one RCT and one observational studies) that reported on body weight status showed no significant change.

An observational study from India showed no significant effect of subsidies on foods that contribute to a healthy diet on undernutrition, two observational studies from Australia found mixed results, and one observational study from Australia reported a significant improvement in mean red blood cell folate z-score among children.

No studies were identified for the outcomes of product changes, unintended consequences, diet-related NCDs or pregnancy outcomes.

3.2 Evidence on contextual factors

A total of 301 publications were included in the review of contextual factors relevant to fiscal and pricing policies to promote healthy diets (29). The overall aim of the review was to search for, identify, summarize and present information on the impact of contextual factors on implementation of fiscal and pricing policies to promote healthy diets.

Forty-one publications provided evidence relating to values. Study populations varied in their values about body weight status. In HICs, overweight and obesity were generally perceived as a serious health problem. Women were more likely than men to perceive overweight and obesity (especially childhood obesity) as a serious health problem, as were people of lower SES compared with their higher-SES counterparts. In contrast, in many studies from LMICs, overweight and obesity were perceived as indicating good health or interpreted as “normal weight”. However, in some countries that have perceived overweight and obesity as indicating good health, values are changing, and normal-weight BMI is increasingly considered healthy. In contrast to values about body weight status, there was no variability in values about diet-related NCDs, which were perceived negatively in all identified studies. No studies were identified on values and food prices.

Fifty-six publications provided evidence relating to resource implications. Evidence was identified in modelling studies, from both LMICs and HICs. All studies that presented cost-effectiveness analyses of modelled taxes on SSBs found modelled taxes to be cost-effective or cost-saving. Studies that did not present cost-effectiveness analyses generally found that the intervention resulted in healthcare cost savings. Studies that modelled taxes on foods that are inconsistent with a healthy diet, or a combination of subsidies and taxes, found the intervention to be cost-effective or cost-saving. Of the studies that presented cost-effectiveness analyses of modelled subsidies or rewards, all but two found the modelled scenarios to be cost-effective or cost-saving. Cost-benefit analyses of policy options to restrict volume promotions for products high in fats, sugars and/or salt estimated that all options analysed would have net benefits. In some instances, the revenue from SSB taxes has been used to finance healthcare programmes and salaries of healthcare professionals, or for healthy food incentives, school food programmes or community development.

Seventy publications provided evidence relating to human rights and equity. Special Rapporteurs on the right of everyone to the enjoyment of the highest attainable standard of health and on the right to food have called for healthy foods to be made economically accessible, and have recommended taxes on SSBs, and on foods high in saturated fatty acids, *trans*-fatty acids, sodium and/or sugars; these taxes can be used to subsidize access to fruits and vegetables, and for educational campaigns on healthy diets. Some studies, however, report that taxes on foods and non-alcoholic beverages are perceived to be inappropriately intrusive. Taxes on foods that are inconsistent with a healthy diet and subsidies for healthier foods appear to be among the interventions to promote healthy eating that are most likely to decrease health inequalities, compared to interventions such as marketing restrictions, nutrition labelling, mass media public information campaigns or community-based health education. Although taxes on foods and non-alcoholic beverages are generally considered to be financially regressive, many studies found taxes to be equitable because of their progressive health benefits. Subsidies can also have an explicit focus on health equity, such as when they are targeted at people of lower SES. Three studies that examined employment changes associated with implementation of taxes found no negative impacts on employment.

A total of 153 publications provided evidence relating to acceptability. The evidence showed that acceptability of fiscal and pricing policies to promote healthy diets varied greatly by stakeholder. The existence of such policies, or national action plans that recommend implementation of such policies, indicates acceptability to government and policy-makers; the increasing number of countries implementing SSB taxes suggests that these taxes may be more acceptable than other fiscal and pricing policies. Evidence from a systematic review and meta-analysis showed that 39–66% of the

public supported an SSB tax; studies reported variation in acceptability according to age, sex, parental status, education, SES, political beliefs and ethnicity. Variation in acceptability was also linked to tax framing and hypothecation. For example, the use of tax revenue for health purposes is linked to greater public acceptability of taxes. Acceptability to industry of taxes on food and non-alcoholic beverages appeared very low, with multiple examples of lobbying against taxes and interference in policy processes. Limited evidence was found relating to environmental acceptability.

Seventy-eight publications provided evidence relating to feasibility. The existence of fiscal policies (particularly SSB taxes) in some countries points to their feasibility. Evidence identified on feasibility showed that facilitators of the development and implementation of policies include strong political leadership, intersectoral collaboration, supporting evidence, community support, and the use of existing governmental infrastructure and taxation mechanisms. Barriers to development and implementation include complexity of the development process, conflicting interests, industry interference and pressure, a weak evidence base and the (perceived) administrative burden. Facilitators of monitoring, evaluation and enforcement include establishment of independent advisory committees, support from academia or health institutions, and collaborative efforts between stakeholders. Barriers to monitoring, evaluation and enforcement include a lack of plans or programmes for monitoring, evaluation and enforcement; and actual or perceived costs of monitoring, evaluation and enforcement.

4 WHO Recommendations

Based on the review of evidence described above, consideration of contextual factors, and expert opinion, the WHO NUGAG Subgroup on Policy Actions formulated the below recommendations on taxation of foods and SSBs and on a subset of food subsidies.

WHO Recommendations

Recommendation 1

WHO recommends implementation of a policy to tax sugar-sweetened beverages (SSBs).

Strong recommendation

Rationale

- This strong recommendation is supported by evidence of a large desirable intervention effect on two critical outcomes, i.e. price change and purchases. Due to the large effect, the certainty of observational evidence was deemed moderate. The strong recommendation is further supported by negligible costs of implementation, favourable cost-effectiveness, evidence of acceptability and feasibility, and the potential that the intervention increases equity and probably increases human rights.

Remarks

- For this recommendation, SSBs refer to a broad set of non-alcoholic beverages. They are defined as all types of beverages containing free sugars,^{45,46} including carbonated or non-carbonated soft drinks, fruit and/or vegetable juice⁴⁷ and drinks, nectars, liquid and powder concentrates, flavoured water, vitamin waters, energy and sports drinks, ready-to-drink teas, ready-to-drink coffee, flavoured milks and milk-based drinks, and plant-based milk substitutes.
- This recommendation covers SSBs purchased for either adults or children.
- Implementing a policy to tax SSBs increases their prices. Consumers respond to tax-induced price increases by reducing their purchases.

⁴⁵ Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates (WHO *Guideline: sugars intake for adults and children*, 2015; http://www.who.int/nutrition/publications/guidelines/sugars_intake/en/).

⁴⁶ Taxation policies that contributed to the evidence included policies relating to both SSBs and beverages sweetened with non-sugar sweeteners (NSSBs). However, it was not possible to identify a difference in effectiveness between taxes that target SSBs only and those that target SSBs and NSSBs.

⁴⁷ None of the policies in the evidence base for this recommendation included fruit juices as a taxable product. However, reducing consumption of fruit juices could contribute to reducing overall sugars intake because of the sugars content of fruit juices.

- The effect of the tax on purchases is proportional to the price increase triggered by the tax.
- Implementation of policies to tax SSBs thereby has the potential to influence consumption of SSBs.
- Implementing a policy to tax SSBs may also encourage product changes and reformulation, and lead to a decrease in sugars content of the taxed beverages. For example, taxes levied at higher rates on products containing more sugar (e.g. tiered taxes) can provide incentives for manufacturers to reformulate their products and for consumers to switch to products containing less sugar.
- The effectiveness of a policy depends on its design and administration. Policy design considerations include the type of tax, the tax rate, taxable products and the nutrient profile model used to define taxable products, as well as possible substitution effects of the tax.
- Evidence from subnational studies suggests that the effect of the tax may be affected by cross-border shopping.
- The regressivity of a tax on SSBs is a narrow view of the impact of the tax looking at the burden of a tax with respect to income and ignoring other wider aspects such as impact on expenditures and economic gains from the health impact gains following a reduction of use due to the tax.

Recommendation 2

WHO suggests implementation of a policy to tax foods inconsistent with a healthy diet.

Conditional recommendation

Rationale

- This conditional recommendation was formulated based on the very low certainty evidence from a limited number of real-world policy evaluations and evidence from modelling studies that food taxes – if well designed – would be expected to have a desirable and large effect. The recommendation was further supported by evidence on probable acceptability and feasibility, on probably favourable cost-effectiveness and the potential that the intervention may increase equity and human rights.

Remarks

- For this recommendation, “foods inconsistent with a healthy diet” refers to foods that are high in saturated fatty acids, *trans*-fatty acids, free sugars and/or salt, usually highly processed, and may fall into a discretionary food category.

- This recommendation covers such foods purchased for either adults or children.
- Price changes that affect the cost of foods can influence decisions on food purchases. Taxation of foods can raise their price and provide a disincentive to purchase.
- Although there are variations in policy designs, implementation of a policy to tax foods may reduce purchases of taxed foods as a consequence of price increases, and has the potential to affect their consumption.
- A single nutrient tax (based on evidence from a tax on saturated fatty acids) may also increase prices and reduce purchases of taxed products. However, such a tax is likely to have a broad range of taxable products and could include foods that do not fall into a discretionary food category.
- The effectiveness of a policy depends on its design and administration. Policy design considerations include the type of tax, the tax rate, taxable products and the nutrient profile model used to define taxable products, as well as possible substitution effects of the tax.
- The regressivity of a tax on foods is a narrow view of the impact of the tax looking at the burden of a tax with respect to income and ignoring other wider aspects such as impact on expenditures and economic gains from the health impact gains following a reduction of use due to the tax.

Recommendation 3

WHO suggests implementation of a policy to subsidize foods that contribute to a healthy diet.

Conditional recommendation

Rationale

- This conditional recommendation was formulated based on the very low certainty of evidence on a subset of targeted food subsidies, as the evidence appears to indicate desirable effects. The recommendation was further supported by evidence on the probable acceptability and feasibility, on probably favourable cost-effectiveness and the potential that the intervention may increase equity and human rights.

Remarks

- This recommendation is made based on evidence from a subset of targeted food subsidies that provide price incentives to consumers at the retail level (including through rebates, discounts, monetary vouchers or coupons or removal of a value added tax on the target food).
- For this recommendation, examples of “foods that contribute to a healthy diet” are vegetables and fruit, legumes and whole grains.
- This recommendation covers such foods purchased for adults and children.
- Price changes that affect the cost of food can influence decisions on food purchases. A subsidy on foods that contribute to a healthy diet can reduce their price and provide an incentive to purchase.
- Although there are variations in policy designs, implementation of a policy to subsidize foods that contribute to a healthy diet may increase purchases of the subsidized food among the target population, suggesting a potential benefit.
- Inequities exist in nutrition status and diet-related health status, with lower-income populations bearing a disproportionate burden of disease, and subsidies may reduce such inequities.
- The effectiveness of a policy to subsidize foods that contribute to a healthy diet must consider the country context, and depends on a number of policy design elements, including how subsidies are delivered, the geographical distribution of subsidies, to whom subsidies are delivered and which foods are subsidized.

5 Implementation considerations

A number of key implementation considerations were identified through the review of contextual factors and deliberations of the NUGAG Subgroup on Policy Actions during the evidence to decision discussions (see **Annex 7** for evidence to decision tables). The considerations discussed in this section are not exhaustive. Detailed guidance on the implementation of SSB taxation can be found in the WHO manual on SSB taxation policies (5). Numerous additional global and regional implementation resources on fiscal policies to promote healthy diets (1, 5, 36), and on taxation in general (2), may serve as useful references to support implementation of the recommendations in this guideline and to ensure that general principles of tax design are taken into account.

5.1 Overarching considerations

A comprehensive policy approach is needed to create enabling and supportive food environments, and actions should be considered in the context of the myriad other individual, social and environmental influences on nutrition. The recommendations in this guideline should therefore be considered together with those in other WHO guidelines on policies to improve the food environment, including those on policies to protect children from the harmful impact of food marketing (20), school food and nutrition policies (22), and nutrition labelling policies (21). Also relevant for improving the food environment and promoting healthy diets are the WHO guideline on school health services (80); the Global Standards for Health Promoting Schools (81); WHO guidelines on sodium intake (23) and sugars intake (24); forthcoming WHO guidelines on total fat, saturated fatty acids and *trans*-fatty acids, polyunsaturated fatty acids, carbohydrates, use of non-sugar sweeteners and use of low-sodium salt substitutes; and the recommendations of the WHO Commission on Ending Childhood Obesity (25).

The recommendations in this guideline may require adaptation to the local context of WHO regions and Member States, including the country's nutritional situation, cultural context, locally available foods, dietary customs, available resources and capacities, and existing policies and governance structures. Also important are the country's institutional arrangements relevant to fiscal policies – for example, designation of competent authorities for the implementation and enforcement of fiscal policies, including tax laws.

5.2 Policy design considerations

To ensure their effectiveness, fiscal policies to promote healthy diets should be well designed, with consideration given to policy design elements such as the products subject to a tax or subsidy, the tax or subsidy rate, the tax type, structure and base. Policy design elements specific to SSB taxation are described in detail in the above mentioned manual (5). Importantly, policy design elements must be in line with country-specific legal frameworks for fiscal policies.

Nutrient profiling can help define the products to be taxed or subsidized. It provides a means of differentiating between foods that are more likely to be part of a healthy diet (and therefore could be subsidized) and those that are less likely to be part of a healthy diet, notably foods that may contribute to excess consumption of energy, saturated fatty acids, *trans*-fatty acids, free sugars and/or salt, (and therefore could be taxed). When determining which products will be subject to the tax or subsidy, the country context, including the local food culture, should also be considered.

The taxable products can also be defined through a single nutrient – for example, saturated fatty acids. Although a single nutrient tax on food may increase prices and reduce purchases of taxed products, evidence on the desirable or undesirable effects of such taxes is still limited. A nutrient-based food tax is likely to have a broad range of taxable products and could therefore include both foods that fall into a discretionary food category and foods that contribute to a healthy diet.

The impact a tax will have on purchases and consumption is affected by substitution. The consumer response to a tax-induced price increase is greater if close substitutes are available. These close substitutes should be healthier to minimize substitution to similarly less healthy (and untaxed) foods.

The tax rate should be sufficiently high to deter consumption. The effect of the tax is likely to be larger if the tax rate is higher. Based on current evidence, the estimated reduction in consumer purchases of SSBs in response to a price increase is about 1.6 times the price increase.

Countries can structure a tax in different ways. It is beyond the scope of this guideline to describe different tax types in detail, but information is available elsewhere (2, 5). In summary, specific excise taxes are most likely to lead to higher prices and therefore discourage consumption (2, 38). Such taxes also increase the price of all taxed foods and beverages by the same amount, reducing the incentive for consumers to substitute to a cheaper taxed product (37, 38). In contrast, ad valorem excise taxes may increase (absolute) price differences between taxed products, potentially incentivizing consumers to substitute to cheaper taxed products rather than healthier untaxed products (2). Compared with uniform tax structures, tiered structures based on nutrient content levels may encourage consumers to substitute to foods and beverages containing lower levels of the targeted nutrient, as well as encourage industry to reformulate foods and beverages (36, 82-89)

As inflation devalues specific excise taxes and diminishes their effect in reducing consumption, as seen with taxes on tobacco products (2), specific excise taxes on SSBs or foods should be regularly adjusted for inflation and income growth to ensure that they remain effective.⁴⁸

Greater attention should be paid to monitoring any cross-border shopping in smaller jurisdictions, given that the extent to which cross-border shopping may occur is likely to depend on the geographical jurisdiction (39). It is important to note that experience from tobacco taxation indicates that non-price factors such as governance status, weak regulatory frameworks, and the availability of informal distribution networks appear to be far more important factors than price and tax differentials between jurisdictions (90). Regional and international cooperation also offers opportunities to minimize cross-border shopping (5).

The existence of a monitoring system and government or independent third-party monitoring may increase the effectiveness of food environment policies (91). Collection of data at baseline should be prioritized to allow evaluation of the policy and inform decision-making about any possible adjustments (71). Potential indicators for evaluation include prices, purchases, consumption and dietary intake. For further evaluation considerations, see section 6.

5.3 Resource considerations

Taxes on simply defined foods (e.g. SSBs) may be simpler to implement than taxes targeting multiple nutrients, especially in countries with low resources (38); taxes targeting an individual nutrient can be administratively burdensome to implement because they apply to a wide range of foods (92). Although specific excise taxes based on nutrient content (e.g. SSB taxes based on sugars content) are likely to have a larger impact, simpler taxes (e.g. volume-based SSB taxes) may be more feasible in countries with weaker tax administration systems. In general, and reflecting on the policies included in the evidence base, the resources required are likely to be greater for subsidies than for implementing taxation policies, as subsidies can have a high administrative burden, and the resources required will be ongoing.

5.4 Equity considerations

Countries may be concerned about the possible financial regressivity of a tax, but this possibility must be weighed against the health benefits, which have most often been shown to be greatest for the most vulnerable population groups. Furthermore, there are potential benefits from using the revenue,

⁴⁸ This applies to specific excise taxes (a tax per unit, rather than as a percentage of value) and builds on evidence from tobacco taxation. To ensure that taxes maintain their “real value”, they should be adjusted regularly. See also Chapter 5: Design and administration of taxes on tobacco products, in National Cancer Institute monograph 21: *The economics of tobacco and tobacco control*.

while not being dependent on it. Revenue can, for example, be used for social protection interventions and interventions targeting vulnerable populations.

Although taxes appear likely to improve health equity (29), some studies suggest that general (i.e. not targeted) subsidies on foods that contribute to a healthy diet may disproportionately benefit groups with higher SES (92). Targeting subsidies – for example at people of lower SES – ensures an explicit focus on health equity.

5.5 Acceptability considerations

Different actors vary greatly in their acceptance of fiscal policies (29), with tax policy design elements having different implications for their interests and goals (2). Public acceptability of taxes on SSBs or foods that are inconsistent with a healthy diet is influenced by how the revenue raised by such taxes is used – public acceptability may be increased if the revenue is earmarked or used for health programmes (29). Policy-makers should be prepared for industry opposition to taxes on SSBs or foods that are inconsistent with a healthy diet, including arguments that taxes would be ineffective and unfair, and would lead to job losses (29). Such opposition can be overcome with a broad coalition of supporters (e.g. community leaders, health organizations, grassroots organizations), and sufficient resources and ability to respond to industry arguments (36, 37, 41). The WHO manual on SSB taxation policies discusses the political economy of SSB taxation and offers insights into tactics commonly used by industry actors and proposes strategies to support the adoption of an SSB tax and counter industry opposition (5).

5.6 Feasibility considerations

The feasibility of the implementation of fiscal policies to promote healthy diets is likely to depend on existing government infrastructure, taxation mechanisms and administrative capacity (29).

Factors such as strong political leadership, intersectoral collaboration, supporting evidence, community support, and the use of existing governmental infrastructure and taxation mechanisms may facilitate the development and implementation of fiscal policies to promote healthy diets. On the other hand, the complexity of the development process, conflicting interests, industry inference and pressure, a weak evidence base, the (perceived) administrative burden, and a lack of financial and human resources may hinder development and implementation (29).

The feasibility of subsidies on foods that contribute to a healthy diet is also likely to depend on available fiscal space and existing benefit programmes, such as social protection programmes. Taxes on foods that are inconsistent with a healthy diet require capacity to define the taxable products and control possible substitution effects; these are more complex than taxes on SSBs.

5.7 Additional resources

As noted, the considerations discussed in this section are not exhaustive, and existing global and regional implementation resources (**Box 1**) may be used and consulted when translating the recommendations in this guideline to actions.

Box 1. Additional resources for development and implementation of fiscal policies to promote healthy diets

Global

Manual on sugar-sweetened beverage taxation policies to promote healthy diets (5)

Building momentum: lessons on implementing a robust sugar sweetened beverage tax (4)

Regional

Potential for sugar-sweetened beverage taxes in Ukraine: estimated impacts of a sugar-sweetened beverage excise tax on price, consumption and tax revenue (93)

Reducing the consumption of sugar-sweetened beverages and their negative health impact in Estonia (94)

Sugar-sweetened beverage taxation in the Region of the Americas (1)

Sugar-sweetened beverage taxes in the WHO European Region: success through lessons learned and challenges faced (36)

Taxes on sugar-sweetened beverages as a public health strategy: the experience of Mexico (41)

Technical report on: taxation for sugar-sweetened beverages in Sri Lanka (95)

Using price policies to promote healthy diets (71)

6 Research gaps

Based on the results of the systematic review, the review of contextual factors and the discussions of the NUGAG Subgroup on Policy Actions, a number of research gaps and considerations were identified. These will be important when updating this guideline, and for further advocacy and action on fiscal policies to promote healthy diets.

6.1 Overarching research gaps

Overall, there is a lack of evidence from policy evaluations, particularly from LMICs, assessing the impact and the policy process of policies, which would provide valuable insights into contextual factors affecting the implementation of fiscal policies.

Effectiveness of policies

Much of the research identified in the systematic review focused on immediate outcomes (e.g. price change, purchases, consumption); few or no suitable studies were available for longer-term outcomes (e.g. body weight status, diet-related NCDs, undernutrition, pregnancy outcomes) (27, 28). This is probably because most fiscal policies have been only recently implemented, and any changes in long-term outcomes are expected to occur gradually over time. Studies on longer-term outcomes would be valuable when updating this guideline, but these are associated with substantial methodological challenges – for example, disentangling the impact of food prices from the complex array of factors that contribute to outcomes such as body weight status and diet-related NCDs that develop gradually over time. There is also a need to be realistic about the extent to which any one intervention can be expected to impact these more distal outcomes on its own. High-quality studies on proximal outcomes will therefore remain valuable. However, a recent evaluation of the national SSB tax in Mexico that included BMI percentile as an outcome (96) – which was published after the systematic review was completed – illustrates that studies focused on more distal outcomes are possible. (The evaluation showed a 1.3 percentage point (or 3%) decrease in overweight and obesity prevalence among adolescent girls following implementation of the tax, and no significant change for boys (96).)

Based on the systematic review and GRADE assessment, there was very low certainty evidence on the effect of taxes and subsidies on purchases and consumption of untaxed foods and beverages, which provide measures of substitution effects. If consumption of foods or beverages that are inconsistent with a healthy diet remains the same or increases in response to a tax or subsidy, the fiscal policy may not have the desired outcome. To ensure the effectiveness of policies and mitigate any such unintended consequences, there is a need for further studies investigating substitution effects.

Based on the systematic review, no evidence was identified on the effectiveness of pricing policies to promote healthy diets. Studies on such policies would be valuable to enable formulation of relevant recommendations when updating this guideline.

Taxes affect demand and supply of products, which will result in a shift in the market equilibrium. Information on longer-term shifts in market equilibrium of fiscal policies would improve understanding of the effects of taxes on food systems.

Contextual factors

Although the review of contextual factors found substantial evidence relating to the acceptability of taxes, there was far less evidence relating to the acceptability of subsidies (29).

For pricing policies, there was little evidence with regard to contextual factors, including for resource implications, acceptability and health equity (29). The little evidence that was found for health equity provided mixed evidence on the uptake of pricing promotions by SES (29); further research may provide more clarity.

6.2 Considerations for the design of future evaluations

Although RCTs are often considered the gold standard study design in research, natural experiments (e.g. using difference-in-difference or interrupted time-series methods) are likely to be the most appropriate for evaluating the impact of fiscal policies (39, 97). A recent review of worldwide experience evaluating SSB taxes provides several considerations that should be taken into account to ensure that evaluations of such taxes are useful and rigorous, including the advantages and challenges of different methods, the outcomes that are likely to be of interest to different actors, and the strengths and limitations of different data sources (39). Process evaluations of fiscal policies are also important (39), and can provide important contextual information about factors that support or hinder policy implementation, for example.

The certainty of evidence from included policy evaluation studies, most of which were observational, was either low or very low for all but two outcomes (**Annex 6**). The certainty of the evidence was often downgraded as a result of serious risk of bias, serious inconsistency, serious indirectness (because evidence came from a single setting representing a single country context) or serious imprecision. The inconsistency of effect could result from variations in policy design; however, the current evidence base did not allow quantitative subgroup analysis of policy design. Emerging evidence may enable future systematic reviews to further explore reasons for inconsistency of effect.

Several studies in the systematic review lacked statistical testing and, as such, were excluded from pooled analysis. Future studies should include statistical testing to ensure that they can be included in pooled analysis.

Analyses by SES, sex, gender and geographical location were not possible in the systematic review, with only a small subset of studies reporting data for subpopulations. Where possible, future studies should include data disaggregated by these characteristics to enable analysis of the impact on health equity of fiscal policies to promote healthy diets.

7 Guideline dissemination, implementation and evaluation

This guideline will be disseminated through the networks of WHO regional offices and country offices, WHO collaborating centres, UN partner agencies and civil society agencies, relevant nutrition webpages on the WHO website⁴⁹ 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.

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 WHO Global database on the Implementation of Nutrition Action (GINA)⁵⁰ and the WHO NCD Country Capacity Survey. GINA 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. GINA currently contains information on thousands of policies (including legislation), nutrition actions and programmes in more than 190 countries. 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 (18, 19). By providing programmatic implementation details, specific country adaptations and lessons learned, GINA serves as a platform for monitoring and evaluating how policy guidelines are being translated and adapted in various countries. The WHO NCD Country Capacity Survey is a global survey of all Member States that provides a periodic assessment of national capacity for NCD prevention and control, including in a number of nutrition-related areas.

⁴⁹ <http://www.who.int/nutrition/en/>

⁵⁰ <http://www.who.int/nutrition/gina/en/index.html>

8 Updating the guideline

In line with the *WHO handbook for guideline development* (26), the recommendations in this guideline will be regularly updated, based on new data and information. The WHO Department of Nutrition and Food Safety and the Department of Health Promotion will be responsible for coordinating updates of the guideline, following the formal procedure described in the *WHO handbook for guideline development* (26). 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 recommendations in the guideline 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 the Department of Nutrition and Food Safety electronic mailing lists, as well communicating directly with actors, as necessary.

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Annex 1: WHO Secretariat

(To be added before finalization)

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Annex 2: Members of the WHO Steering Committee (Headquarters)

(To be added before finalization)

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Annex 3: Members of the WHO Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Policy Actions

(To be added before finalization)

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Annex 4: External resource people

(To be added before finalization)

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Annex 5: External peer review group

(To be added before finalization)

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Annex 6: GRADE evidence profiles

GRADE evidence profile 1: What is the effect in adults and children on the outcomes of interest of implementing a tax on sugar-sweetened beverages compared with not implementing the policy?

Population: Children and adults

Intervention: Tax on sugar-sweetened beverages

Comparison: No tax

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
Price change: measured using pass-through rates								
49	Non-RCTs	Not serious ¹	Not serious ²	Not serious ³	Not serious ⁴	Large effect (pass-through rate: 82%)	<p><i>Meta-analysis</i> of 46 estimates from 41 studies for 18 tax policies: significant increase in prices of taxed beverages; overall pass-through rate of 82% (95% CI: 66 to 98%); $I^2 = 99\%$.</p> <p>Additional information: subgroup analysis for RoB⁺ High RoB (17 estimates from 15 studies): pass-through rate 81.8% (95% CI: 53 to 110%; $P < 0.001$); $I^2 = 96\%$ Low RoB (26 estimates from 23 studies): pass-through rate 83.7% (95% CI: 63 to 105%; $P < 0.001$); $I^2 = 99\%$ Between-group difference: $P = 0.91$</p> <p><i>Narrative analysis</i> of 12 estimates from 8 studies (89, 98-104) for 10 tax policies: 10 estimates (from 7 studies (89, 98-103)) suggested increased prices, but did not provide statistical testing; and 1 study (104) of 2 US state sales taxes showed significant increase in prices for 1 state, but no significant change in another state.</p>	⊕⊕⊕○ Moderate
Purchases (direct effects): measured using PE								
43	Non-RCTs	Not serious ⁵	Not serious ⁶	Not serious ⁷	Not serious ⁸	Large effect (PE: -1.59)	<p><i>Meta-analysis</i> of 35 estimates from 33 studies for 16 tax policies: significant reduction in purchases of taxed beverages; PE of -1.59 (95% CI: -2.11 to -1.08); $I^2 = 100\%$.</p> <p>Additional information: subgroup analysis for RoB⁺⁺ High RoB (16 estimates from 16 studies): PE -1.91 (95% CI: -2.96 to -0.86; $P = 0.0015$); $I^2 = 99.7\%$ Low RoB (16 estimates from 14 studies): PE -1.59 (95% CI: -2.29 to -0.88; $P < 0.001$); $I^2 = 99.7\%$ Between-group difference: $P = 0.59$</p>	⊕⊕⊕○ Moderate

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							<p>Additional information: average % change in purchases (reduction in demand) for taxed beverages was -15% (95% CI: -20% to -9%); $I^2 = 100\%$.</p> <p>Additional information: subgroup analysis for RoB⁺⁺ High RoB (16 estimates from 16 studies): % demand reduction -10% (95% CI: -14% to -6%; $P < 0.001$); $I^2 = 99.9\%$ Low RoB (16 estimates from 14 studies): % demand reduction -18% (95% CI: -28% to -8%; $P = 0.001$); $I^2 = 99.8\%$ Between-group difference: $P = 0.11$</p> <p><i>Narrative analysis</i> of 14 estimates from 10 studies (87, 89, 98-100, 102, 104-107) for 10 tax policies: 3 estimates (from 3 studies (89, 105, 106)) showed significant decrease in purchases of taxed beverages; 9 estimates (from 6 studies (87, 98-100, 102, 107)) reported decrease, but did not provide statistical testing; and 2 estimates (from 1 study (104)) found no significant change (for US sales taxes).</p>	
Purchases (substitution effects): measured using PE								
32	Non-RCTs	Not serious ⁹	Serious ¹⁰	Not serious ¹¹	Serious ¹²	Publication bias suspected ¹³	<p><i>Meta-analysis</i> of 25 estimates from 24 studies for 14 tax policies: no significant change in purchases of untaxed beverages; PE of 0.42 (95% CI: -0.52 to 1.35); $I^2 = 98\%$.</p> <p>Additional information: subgroup analysis for RoB⁺⁺⁺ High RoB (14 estimates from 14 studies): PE 0.14 (95% CI: -0.86 to 1.13; $P = 0.77$); $I^2 = 98\%$ Low RoB (10 estimates from 9 studies): PE 0.47 (95% CI: -2.76 to 3.71; $P = 0.75$); $I^2 = 92\%$ Between-group difference: $P = 0.82$</p> <p><i>Narrative analysis</i> of 8 studies (87, 102, 105-110) for 6 tax policies: studies showed large mix of results - 4 studies (102, 105, 108, 109) showed no change (2 studies provided statistical testing); 3 studies (87, 107, 110) showed increase in purchases (1 study provided statistical testing); and 1 study (106) showed mixed results across retailers.</p>	⊕⊕⊕ Very low
Consumption (direct effects): measured using PE								
13	Non-RCTs	Very serious ¹⁴	Serious ¹⁵	Not serious ¹⁶	Serious ¹⁷	None	<p><i>Meta-analysis</i> of 12 estimates from 9 studies for 5 tax policies (all subnational): reduction in consumption of taxed beverages for children and adults with pooled effect of PE -3.78 (95% CI: -8.86 to 1.30); $I^2 = 82\%$.</p> <p>Additional information: subgroup analysis for RoB⁺⁺⁺⁺ High RoB (6 estimates from 6 studies): PE -6.46 (95% CI: -14.34 to 1.41; $P = 0.09$); $I^2 = 88\%$</p>	⊕⊕⊕ Very low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							<p>Low RoB (6 estimates from 3 studies): PE -0.24 (95% CI: -1.26 to 0.77; $P = 0.56$); $I^2 = 0\%$ Between-group difference: $P = 0.04$</p> <p>Additional information: average % change in consumption (demand for taxed beverages) for children and adults was -18% (95% CI: -38 to 1%); $I^2 = 53\%$.</p> <p>Additional information: subgroup analysis for RoB**** High RoB (6 estimates from 6 studies): % demand reduction -33% (95% CI: -46% to -21%; $P < 0.001$); $I^2 = 0\%$ Low RoB (6 estimates from 3 studies): % demand reduction -3% (95% CI: -21% to 14%; $P = 0.63$), $I^2 = 0\%$ Between-group difference: $P < 0.001$</p> <p>Additional information: analyses separately for children and adults**** Adults (9 estimates from 9 studies): PE -4.64 (95% CI: -10.0 to 0.72); $I^2 = 86\%$ % change -24% (95% CI: -43% to -4%); $I^2 = 46\%$ Children (3 estimates from 3 studies): PE -0.17 (95% CI: -2.18 to 1.84); $I^2 = 0\%$ % change 0.1% (95% CI: -32% to 33%); $I^2 = 0\%$</p> <p><i>Narrative analysis</i> of 4 studies (111-114) for 2 tax policies (Mexico and US sales taxes): 2 studies (111, 112) showed a significant decrease in consumption of taxed beverages; and 2 studies (113, 114) (for US sales taxes) showed no significant change.</p>	
Consumption (substitution effects): measured using PE								
11	Non-RCTs	Very serious ¹⁸	Not serious ¹⁹	Not serious ²⁰	Not serious ²¹	None	<p><i>Meta-analysis</i> of 12 estimates from 9 studies for 5 tax policies (all subnational): no change in consumption of untaxed beverages, with PE of 0.54 (95% CI: -0.60 to 1.68); $I^2 = 48\%$.</p> <p>Additional information: subgroup analysis for RoB**** High RoB (6 estimates from 6 studies): PE 1.73 (95% CI: -3.62 to 7.07; $P = 0.44$); $I^2 = 71\%$ Low RoB (6 estimates from 3 studies): 0.06 (95% CI: -0.12 to 0.25; $P = 0.42$); $I^2 = 0\%$ Between-group difference: $P = 0.42$</p> <p>Additional information: analyses separately for children and adults**** Adults (9 estimates from 9 studies): PE 0.71 (95% CI: -0.58 to 2.00); $I^2 = 57\%$</p>	⊕○○○ Very low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							<p>Children (3 estimates from 3 studies): PE 0.02 (95% CI: -0.22 to 0.26); $I^2 = 0\%$</p> <p><i>Narrative analysis</i> of 2 studies (111, 114) for 1 tax policy: 1 study (114) showed significant increase in consumption of untaxed beverages; and 1 study (111) showed mixed results by type of beverage.</p>	
Diet (energy, total food and/or nutrient intake, nutritional quality)								
2	Non-RCTs	Serious ²²	Serious ²³	Serious ²⁴	Not serious ²⁵	None	<p>Unclear effects (insufficient evidence)</p> <p><i>Narrative analysis</i> only of 2 studies (111, 114) on US sales taxes on soft drinks: 1 study (111) reported no statistically significant change in total daily caloric intake (-7.840 calories; SE 12.353), or nutrient intake of vitamin C (blood serum measure 0.008 mg/dL; SE 0.011; and dietary recall measure 1.634 mg; SE 2.019) or vitamin D (blood serum measure 0.072 ng/mL; SE 0.372).</p> <p>The other study (114) found a statistically significant positive association between soft drink taxes and total daily caloric intake in adults (27.683 calories; SE 12.555; $P = 0.034$).</p>	⊕⊕⊕⊕ Very low
Product changes (portion size, food reformulation, portfolio mix)								
6	Non-RCTs	Not serious ²⁶	Not serious ²⁷	Not serious ²⁸	Not serious ²⁹	None	<p><i>Narrative analysis</i> only of 6 studies (83-87, 89) for 3 tax policies (all tiered taxes; only 1 study provided statistical testing): all studies showed decrease in sugar content or calories of beverages.</p> <p>1 study from the UK (84) found a statistically significant difference in percentage of drinks over lower levy sugar threshold compared with extrapolation of pre-announcement trend (-33.8 percentage points; 95% CI: -34.4 to -33.3; $P < 0.001$).</p> <p>Another study from the UK (85) found that the sugar content of 4 of 7 juice drinks eligible for taxation was reformulated to <5 g/100 mL (the other 3 were not reformulated); no statistical testing was reported.</p> <p>Another study from the UK (86) showed a 23 kcal/100 mL decrease in energy content of supermarket own-label manufacturers and a 15 kcal/100 mL decrease in energy content of brand manufacturers; no statistical testing was reported.</p> <p>Another study from the UK (87) showed a 28.8% decrease in the sales-weighted average total sugar content from 3.9 g/100 mL in 2015 to 2.8 g/100 mL in 2018; no statistical testing was reported.</p> <p>1 study from South Africa (83) showed many brands reformulated to decrease sugar content; no statistical testing was reported.</p>	⊕⊕⊕⊕ Low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							1 study from Portugal (89) showed a 0.04 percentage point decrease in dietary energy density from SSBs due to product reformulation; no statistical testing was reported.	
Unintended consequences (cross-border shopping)								
10	Non-RCTs	Not serious ³⁰	Not serious ³¹	Not serious ³²	Not serious ³³	None	<p><i>Narrative analysis</i> only of cross-border shopping/retail revenue change assessed in 10 studies (98, 105, 107, 115-121) for 5 excise tax policies in local jurisdictions: 4 studies (105, 115-117) reported significant increase in cross-border shopping and/or reduced purchases for retailers in taxed jurisdictions; 3 studies (98, 107, 118) reported changes with no statistical testing provided; 2 studies (119, 120) had mixed results (supermarkets affected but not mass merchandise stores or pharmacies, and only one measure significant in another study); and 1 US study (121) reported no significant effect on cross-border shopping (RIRR 1.00; 95% CI: 0.97 to 1.03).</p> <p>No evidence was available that assessed effects of national taxes on cross-border shopping.</p>	⊕⊕⊕⊕ Low
Unintended consequences (unemployment)								
2	Non-RCTs	Serious ³⁴	Not serious ³⁵	Not serious ³⁶	Not serious ³⁷	None	<p><i>Narrative analysis</i> only of employment effects assessed in 2 studies (122, 123): a US-based study (122) (Philadelphia) found no significant change in unemployment claims compared with neighbouring counties for supermarkets (−9.45; SE 45.24; $P = 0.084$), soft drink manufacturing (−0.13; SE 4.59; $P = 0.98$), all potentially affected industries (9.16; SE 253.80; $P = 0.97$) or total unemployment (−445.85; SE 1952.35; $P = 0.97$). A study in Mexico (123) found a small, but significant, decreasing trend in national unemployment (−0.0201; 95% CI: −0.0292 to −0.0111; $P = 0.000$).</p>	⊕⊕⊕⊕ Very low
Unintended consequences (other)								
3	Non-RCTs	Not serious ³⁸	Not serious ³⁹	Not serious ⁴⁰	Not serious ⁴¹	None	<p><i>Narrative analysis</i> only of 3 studies (124-126) (6 estimates): A UK study (125) reported significant decreased cumulative abnormal returns for 3 of 4 soft drink firms on the day of announcement of the tax, but no significant cumulative abnormal returns for the 4 firms when the tax was implemented. Another UK study (124) reported a significant negative association between the announcement and soft drink manufacturer turnover (−0.058; SE 0.034), but no significant association between the implementation and turnover (0.029; SE 0.035).</p> <p>A US-based study (126) (Oakland) reported no significant difference in exterior advertising at 12 months post-tax (OR 0.90; 95% CI: 0.63 to 1.30), interior advertising at 12 months post-tax (OR 1.04; 95% CI: 0.72 to 1.53) or price promotions at 12 months post-tax (OR 0.72; 95% CI: 0.51 to 1.00).</p>	⊕⊕⊕⊕ Low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
Body weight status, BMI								
5	Non-RCTs	Not serious ⁴²	Not serious ⁴³	Serious ⁴⁴	Not serious ⁴⁵	None	<i>Narrative analysis</i> only of 5 studies (111, 113, 114, 127, 128) (6 estimates) for US sales taxes: 1 study (127) found small but statistically significant decreases in BMI (0.0029 points; SE 0.0004), overweight (0.0002; SE 0.0001) and obesity (0.0001; SE 0.0000)) among adults. 4 studies suggested no statistically significant effect on BMI. Of these: <ul style="list-style-type: none">1 study (114) found no significant impact on BMI (0.007; SE 0.093) and, in Ohio, no significant impact on BMI, overweight or obesity.1 study (128) found no significant impact on BMI among adults (fixed effect regression coefficient 0.0090; SE 0.0122).1 study (111) found no significant impact on BMI z-score (0.015; SE 0.016), obesity (0.009; SE 0.006), overweight (0.002; SE 0.011) or underweight (−0.002; SE 0.003)) among children and adolescents.1 study (113) found no significant difference in BMI z-score, obesity, or overweight or obesity among children and adolescents in states that have ever had a soft drink tax and states without a soft drink tax.	⊕○○○ Very low
Diet-related NCDs (including validated surrogate indicators)								
0								
Undernutrition								
0								
Pregnancy outcomes								
0								

BMI: body mass index; CI: confidence interval; NCD: noncommunicable disease; OR: odds ratio; PE: price elasticity; RCT: randomized controlled trial; RIRR: ratio of incidence rate ratios; RoB: risk of bias; SE: standard error; SSB: sugar-sweetened beverage; UK: United Kingdom; US: United States of America.

Certainty of evidence is described as high ⊕⊕⊕⊕, moderate ⊕⊕⊕○, low ⊕⊕○○ or very low ⊕○○○.

Footnotes:

- + 3 studies (with 3 estimates) that had an unclear RoB were excluded from the subgroup analysis.
- ++ 3 studies (with 3 estimates) that had an unclear RoB were excluded from the subgroup analysis.
- +++ 1 study (with 1 estimate) that had an unclear RoB was excluded from the subgroup analysis.
- ++++No studies were excluded from the subgroup analysis.
- +++++No studies were excluded from the subgroup analysis.

^{1.} Across the outcomes, the following rules were followed for judging the RoB: If 60% or more of studies contributing to the evidence of an outcome had a high RoB, the RoB rating for that outcome was “very serious”. If 41–59% of studies had a high RoB, it was rated as “serious”. If 40% or less of studies had a high RoB, it was rated as “not serious”. For assessing the RoB for outcomes with a smaller number of studies (i.e. less than 5), additional details of the RoB assessment were considered for making the

final judgement. For all outcomes for which meta-analyses were conducted, the overall RoB was assessed for only those studies included in the meta-analysis. For this outcome (price change), a total of 41 studies were included in the meta-analysis. The RoB was rated as being not serious, because 40% or less of all studies contributing to the evidence for this outcome had a high RoB. Low RoB or good quality: 23; high RoB: 15 (36%); unclear RoB: 3. Not downgraded for RoB.

2. All results were around the effect of an increase in prices; with high heterogeneity ($I^2 = 99\%$). Not downgraded for inconsistency.
3. Most included studies were conducted at subnational level, but the certainty was not downgraded for that reason, as one would expect the observed effects in those studies to be even larger for policies implemented at a national level, because the tax pass-through rate is likely to be higher in national-level policies (given that industry can control prices more within smaller, subnational markets, and price increases are typically lower at subnational than at national levels). Although studies were conducted in high-income countries, no difference in effect is expected in low- or middle-income countries. Not downgraded for indirectness.
4. The CI of the tax pass-through rate included values that are consistent with an effect (95% CI: 66 to 98%). Not downgraded for imprecision.
5. We did not downgrade for RoB, although 16 of 33 (48%) studies included in the meta-analysis were at high RoB, because the sensitivity analysis (excluding the high RoB studies) provided consistent results.
6. We did not downgrade for the high level of inconsistency ($I^2 = 100\%$) because it seemed to be driven by a number of studies (e.g. those related to the Philadelphia policy) that show a higher effect than the remaining studies, where the effect would still be considered significant.
7. Most included studies were conducted at subnational level, but the certainty was not downgraded for that reason, as one would expect the observed effects in those studies to be even larger for policies implemented at a national level, because the tax pass-through rate is likely to be higher in national-level policies (given that industry can control prices more within smaller, subnational markets, and price increases are typically lower at subnational than at national levels). Purchases are not expected to change as much with smaller price increases as with larger price increases. Cross-border shopping is less likely to impact the effect of national taxes. Although studies were conducted in high-income countries, no difference in effect is expected in low- or middle-income countries. Not downgraded for indirectness.
8. The CI of the PE included values that are consistent with an effect (95% CI: -2.11 to -1.08). Not downgraded for imprecision.
9. We did not downgrade for RoB, although 14 of 24 (58%) studies included in the meta-analysis were at high RoB, because the sensitivity analysis (excluding the high RoB studies) provided consistent results.
10. Results were inconsistent, suggesting benefits favouring the intervention and the control, with some statistically significant and some not statistically significant, with high heterogeneity ($I^2 = 98\%$). Downgraded for inconsistency.
11. Most included studies were conducted at subnational level, but the certainty was not downgraded for that reason, as one would expect the observed effects in those studies to be even larger for policies implemented at a national level, because the tax pass-through rate is likely to be higher in national-level policies (given that industry can control prices more within smaller, subnational markets, and price increases are typically lower at subnational than at national levels). Purchases are not expected to change as much with smaller price increases as with larger price increases. Although studies were conducted in high-income countries, no difference in effect is expected in low- or middle-income countries. Not downgraded for indirectness. (Note: availability of tap water may influence outcome.)
12. Serious imprecision because the CI of the PE included values suggesting benefits favouring the intervention and the control (95% CI: -0.52 to 1.35). Downgraded for serious imprecision.
13. The Egger test was conducted to test for publication bias in meta-analysed studies. The result of the Egger test was significant ($P < 0.001$), suggesting publication bias.
14. We downgraded for RoB because more than 60% of studies (6 out of 9 studies included in the meta-analysis) had a high RoB. The sensitivity analysis excluding the high RoB studies did not provide consistent results.
15. We downgraded for inconsistency, because results showed a high level of heterogeneity ($I^2 = 82\%$ for PE), and no subgroup effects were identified.
16. Most included studies were conducted at subnational level, but the certainty was not downgraded for that reason, as one would expect the observed effects in those studies to be even larger for policies implemented at a national level, because the tax pass-through rate is likely to be higher in national-level policies (given that industry can control prices more within smaller, subnational markets, and price increases are typically lower at subnational than at national levels). Consumption is not expected to change as much with smaller price increases as with larger price increases. Although studies were conducted in high-income countries, no difference in effect is expected in low- or middle-income countries. Not downgraded for indirectness.
17. Serious imprecision because the CI of the PE included both values suggesting benefits and values suggesting no effect (95% CI: -8.86 to 1.30).
18. We downgraded for RoB because more than 60% of studies (6 out of 9 studies included in the meta-analysis) had a high RoB. The sensitivity analysis excluding the high RoB studies did not provide consistent results.
19. All results were around the effect of no change in consumption ($I^2 = 48\%$). Not downgraded for inconsistency.
20. Most included studies were conducted at subnational level, but the certainty was not downgraded for that reason, as one would expect the observed effects in those studies to be even larger for policies implemented at a national level, because the tax pass-through rate is likely to be higher in national-level policies (given that industry can control prices more within smaller, subnational markets, and price increases are typically lower at subnational than at national levels). Consumption is not expected to change as much with smaller price increases as with larger price increases. Although studies were conducted in high-income countries, no difference in effect is expected in low- or middle-income countries. Not downgraded for indirectness.
21. We did not downgrade for imprecision because the CI of the PE included values that are consistent with no effect or trivial effect (95% CI: -0.60 to 1.68).

22. Overall RoB for this outcome was rated as serious: for one of the studies, the intervention was assessed as having a high RoB because the intervention was likely to affect data collection, completeness of the dataset was unclear, and it was unclear whether the intervention was independent of other changes over time. (The two included studies are from the same author, using the same data, but for a different target population.) The paper targeting adults was rated as high RoB (114); the paper targeting children and adolescents was rated as low RoB (111). Both studies were assessed using the Cochrane Effective Practice and Organisation of Care (EPOC) tool. Downgraded for RoB.
23. Downgraded for inconsistency because of variations in results: one study showed no significant reduction in caloric intake, whereas the other showed a significant positive association between soft drink tax and caloric intake.
24. Indirectness was related to the timing of outcome assessment, because any effect of the policy on diet would be expected beyond the study time frame. Downgraded for indirectness.
25. Included studies had very large sample sizes but small effects, and no CI was reported. Not downgraded for imprecision.
26. No serious RoB, because 40% or less of studies had a high RoB. One interrupted time-series (85) was rated as having an unclear RoB using the EPOC tool, because it was unclear whether the intervention was unlikely to affect data collection. Low RoB: 3; high RoB: 2 (33%); unclear RoB: 1. Not downgraded for RoB.
27. All estimates pointed in the same direction (i.e. reduction in sugar content or calories of beverages); the available CI was narrow; only one of 6 studies provided statistical testing. Not downgraded for inconsistency.
28. Although most studies were conducted in high-income countries, no difference in effect is expected in low- or middle-income countries. Not downgraded for indirectness.
29. Included studies had large sample sizes, with consistent results. One study reported a narrow CI. Not downgraded for imprecision.
30. No serious RoB, because 40% or less of studies had a high RoB. Low RoB: 5; high RoB: 4 (40%); unclear RoB: 1. Not downgraded for RoB.
31. Seven out of 10 studies showed an increase in cross-border shopping/retail revenue, although only four provided statistical testing. One study showed no significant effect. Not downgraded for inconsistency.
32. Included studies were conducted at subnational level, but the certainty was not downgraded for that reason. Cross-border shopping is less likely to impact the effect of national taxes. Not downgraded for indirectness.
33. Included studies had large sample sizes. Small effects reported. Narrow CI reported for one study, consistent with a small effect. Not downgraded for imprecision.
34. Two interrupted time-series were included for this outcome, and their RoB was assessed using the EPOC tool. One study (122) was assessed as having low RoB, and the other study (123) a high RoB, because the intervention was judged not to be independent of other changes. High RoB: 1; low RoB: 1. Downgraded for RoB.
35. Estimates showed either no effect or beneficial effects (i.e. increases in employment or decreases in unemployment). No estimates pointed to an increase in unemployment. Not downgraded for inconsistency.
36. There was no suspicion of indirectness. Not downgraded for indirectness.
37. Included studies had large sample sizes but small effects, where reported. One study reported a narrow CI, consistent with a small effect. Not downgraded for imprecision.
38. The two interrupted time-series (124, 125) were assessed as being low RoB using the EPOC tool. The controlled before-and-after study (126) was assessed as having an unclear RoB using the EPOC tool, because the criterion "protection against contamination (studies using second site as control)" was unclear. Low RoB: 2; unclear RoB: 1. Not downgraded for RoB.
39. All results showed no statistically significant changes for tax effects, after policy implementation. Not downgraded for inconsistency.
40. There was no suspicion of indirectness. Not downgraded for indirectness.
41. Included studies had large sample sizes. Estimates showed either small effects or no effects. Not downgraded for imprecision.
42. No serious RoB, because 40% or less of studies had a high RoB. The interrupted time-series (128) was assessed as having an unclear RoB using the EPOC tool, because the completeness of data was unclear in the study. Low RoB: 2; high RoB: 2 (40%); unclear RoB: 1. Not downgraded for RoB.
43. Estimates showed either no effect or a small reduction in BMI; no estimates pointed to an increase in BMI. Not downgraded for inconsistency.
44. Indirectness related to the timing of outcome assessment, because any effect of the policy on BMI would be expected beyond the study time frame. All studies were conducted on US sales taxes. There is no evidence on the effect of excise taxes. Downgraded for indirectness.
45. Included studies had large sample sizes; no CI reported; only small magnitudes of effects reported, pointing in the same direction. Not downgraded for imprecision.

GRADE evidence profile 2: What is the effect in adults and children on the outcomes of interest of implementing a tax on food, compared with not implementing the policy?

Population: Children and adults

Intervention: Tax on food

Comparison: No tax

Included studies: Tax on non-essential energy-dense food (implemented in Mexico) and other “non-core” food taxes (implemented in Denmark, Hungary, Finland and USA)

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
Price change								
6	Non-RCTs	Very serious ¹	Not serious ²	Not serious ³	Not serious ⁴	None	<p><i>Narrative analysis</i> only of 5 studies (100, 108, 129-131) assessing the impact of the Mexican food tax: 4 studies showed significant increases in prices of taxed products; and 1 study reported an increase, but did not provide statistical testing. Of these:</p> <ul style="list-style-type: none">1 study (108) found a significant impact on price index of taxed food (6.020; SE 0.0805).1 study (129) found a significant increase in the price of snacks (7.048%; SE 0.030; <i>P</i> = 0.000).1 study (130) reported significant increases in price – for example, in DICONSA (state-owned stores) (2.90%; SE 0.94), mini markets (1.90%; SE 0.43), and grocery and convenience stores (2.16%; SE 0.16).1 study (131) found significant increases in price for cookies (0.098; SE 0.002), ready-to-eat cereals (0.051; SE 0.004), salty snacks and peanuts (0.066; SE 0.002), and pre-packaged sweet bread (0.05; SE 0.004).1 study (100) reported increased prices of selected taxed foods, with all increases greater than the combined tax increase and expected inflation, except for cornflakes with sugar and handcrafted sweet bread; no significance testing was reported. <p>A study (102) on 3 food tax policies in Denmark, Finland and Hungary reported increased prices of taxed products (e.g. +2.0% price change for</p>	⊕○○○ Very low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							confectionery in Denmark, +2.9% price change for confectionery in Finland, +3.9% price change for confectionery in Hungary), but did not provide statistical testing.	
Purchases (direct effects)								
9	Non-RCTs	Very serious ⁵	Not serious ⁶	Not serious ⁷	Not serious ⁸	None	<p><i>Narrative analysis</i> only of 6 studies (100, 106, 108, 132-134) (and 6 estimates) for the Mexican tax: 4 studies showed a significant decrease in purchases of taxed products. Of these:</p> <ul style="list-style-type: none"> 1 study (132) found a significant decrease in volume of taxed food purchases per capita per month (−25 g; 95% CI: −38 to −12; $P < 0.05$) 1 study (106) found a significant 18% (1 g/capita/day) decrease in purchases of taxed foods from supermarkets ($P < 0.001$) 1 study (133) found a significant 6.0% decrease (95% CI: −8.2 to −3.8; $P < 0.05$) in the percentage of purchases of taxed foods beyond what would have been expected 1 study (108) found a significant 3% decrease in calories purchased from taxed food per week per household (−84.69 calories; SE: 24.44). <p>One study (134) found mixed results by product (reduction for sweet bread but no change for white bread). Another study (100) found no change in purchases of taxed products.</p> <p>Of the 3 other studies (71, 102, 135) (with 5 estimates) assessing the impact of food taxes in Hungary, Denmark and Finland, and the state tax in Colorado, 2 studies (71, 102) (with 4 estimates) suggested decreased sales of taxed products (including 3 estimates on the percentage change in sales of sweets, with no statistical testing provided); and 1 study (135) found no significant change (0.0060; SE 0.0591).</p>	⊕○○○ Very low
Purchases (substitution effects)								
7	Non-RCTs	Very serious ⁹	Serious ¹⁰	Not serious ¹¹	Serious ¹²	None	<p><i>Narrative analysis</i> only of 5 studies (100, 106, 108, 132, 133) for 1 tax policy in Mexico: studies showed different conclusions across studies. 1 study reported a significant increase in purchases of untaxed products (108); 2 studies reported mixed results across measures (106); and 2 studies</p>	⊕○○○ Very low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							<p>reported no statistically significant change in purchases of untaxed products (132, 133).</p> <p>One study (135) from Colorado, USA, reported a significant increase in monthly purchases of tax-exempt products (i.e. "candy" prepared with flour; effect size increase in purchases 12.15%; SE 3.96), whereas the other study (71), from Hungary, found no change in untaxed products purchased.</p>	
Consumption (direct effects)								
0								
Consumption (substitution effects)								
0								
Diet (energy, total food and/or nutrient intake, nutritional quality)								
0								
Product change (portion size, food reformulation, portfolio mix)								
0								
Unintended consequences (cross-border shopping)								
0								
Unintended consequences (unemployment)								
2	Non-RCTs	Serious ¹³	Not serious ¹⁴	Serious ¹⁵	Not serious ¹⁶	None	<p><i>Narrative analysis</i> only of 2 studies: 1 study (123) from Mexico reported a small, but significant, decreasing trend in national unemployment (–0.0201; 95% CI: –0.0292 to –0.0111; <i>P</i> = 0.000). Another (case) study (134) from Mexico reported on the change in the number of bakery employees (8 of 10 bakeries studied reduced staff; a total of 10 people stopped working), but did not provide statistical testing.</p>	⊕○○○ Very low
Unintended consequences (other)								
0								
Body weight status, BMI								
2	Non-RCTs	Very serious ¹⁷	Not serious ¹⁸	Serious ¹⁹	Not serious ²⁰	None	<p><i>Narrative analysis</i> only of 2 studies for sales taxes: a US study (136) found no significant impact of state snack taxes on BMI (–0.04; SE 0.04). Another US study (137) found no significant impact of a snack tax in Maine on BMI (0.001; SE 0.002).</p> <p>No evidence was available that assessed effects of excise taxes on BMI.</p>	⊕○○○ Very low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
Diet-related NCDs (including validated surrogate indicators)								
0								
Undernutrition								
0								
Pregnancy outcomes								
0								

BMI: body mass index; CI: confidence interval; NCD: noncommunicable disease; RCT: randomized controlled trial; RoB: risk of bias; SE: standard error; US: United States of America.

Certainty of evidence is described as high ⊕⊕⊕⊕, moderate ⊕⊕⊕○, low ⊕⊕○○ or very low ⊕○○○.

Footnotes:

1. Across the outcomes, the following rules were followed for judging the RoB: If 60% or more of studies contributing to the evidence of an outcome had a high RoB, the RoB rating for that outcome was “very serious”. If 41–59% of studies had a high RoB, it was rated as “serious”. If 40% or less of studies had a high RoB, it was rated as “not serious”. For assessing the RoB for outcomes with a smaller number of studies (i.e. less than 5), additional details of the RoB assessment were considered for making the final judgement. For this outcome (price change), a total of 6 studies were included in the narrative analysis. The RoB was rated as being very serious, because more than 60% of studies had a high RoB. High RoB: 6 (100%). Downgraded for RoB.
2. Not downgraded for inconsistency, because all results were around the effect of an increase in price.
3. There was no suspicion of indirectness. Not downgraded for indirectness.
4. Included studies had sufficiently large sample sizes (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period). Estimates showed small effects. Not downgraded for imprecision.
5. Very serious RoB, because more than 60% of studies had a high RoB. Low RoB: 1; high RoB: 7 (78%); unclear RoB: 1. Downgraded for RoB.
6. Not downgraded for inconsistency, because results from 6 out of 9 studies were around the effect of a decrease in purchases of taxed products, with 2 studies showing no effect, and 1 showing mixed results.
7. There was no suspicion of indirectness. Not downgraded for indirectness.
8. All but one of the included studies had sufficiently large sample sizes (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period), and the reported CIs included values that are consistent with a small effect. Not downgraded for imprecision.
9. Very serious RoB, because more than 60% of studies had a high RoB. Low RoB: 1; high RoB: 5 (83%). Downgraded for RoB.
10. Results were inconsistent, suggesting benefits favouring the intervention and the control. Downgraded for inconsistency.
11. There was no suspicion of indirectness. Not downgraded for indirectness.
12. Included studies had sufficiently large sample sizes (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period), but with varying effects or no effect. One study reported a CI that included values suggesting benefits favouring the intervention and the control. Downgraded for imprecision.
13. Two interrupted time-series were included for this outcome, and their RoB was assessed using the EPOC tool. One study(134) was assessed as having unclear RoB due to unclear reliable primary outcome measure(s). The other study (123) was assessed as having high RoB because the intervention was not assessed as being independent of other changes. High RoB: 1; unclear RoB: 1. Downgraded for RoB.
14. One study with a large sample size reported a small but significant decreasing trend in national unemployment, and no change in employment of the manufacturing industry for targeted foods, although one very small study with only 10 bakeries reported a reduction in staff. Not downgraded for inconsistency.
15. Evidence is from one setting, representing a single country context. Downgraded for indirectness.
16. One study had sufficiently large sample sizes (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period), and estimates showed either small effects or no effects. The other study did not provide statistical testing and had a very small sample size with only 10 bakeries included. Not downgraded for imprecision.
17. Two interrupted time-series were included for this outcome, and their RoB was assessed using the EPOC tool. One study (136) was assessed as having high RoB because the intervention was not assessed as being independent of other changes, and data were not analysed appropriately or there were insufficient data points to enable reliable statistical inference. The other study (137) was assessed as having high RoB because data were not analysed appropriately or there were insufficient data points to enable reliable statistical inference. High RoB: 2. Downgraded for RoB.

18. Estimates showed no effect of the tax on BMI. Not downgraded for inconsistency.
19. Indirectness was related to the timing of outcome assessment because any effect of the policy on BMI would be expected beyond the study time frame. All studies were conducted on US sales taxes. There is no evidence on the effect of excise taxes on BMI. Downgraded for indirectness.
20. Included studies had sufficiently large sample sizes (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period). Estimates showed no impact of the assessed tax policy on BMI. Not downgraded for imprecision.

GRADE evidence profile 3: What is the effect in adults and children on the outcomes of interest of implementing a tax on saturated fat, compared with not implementing the policy?

Population: Children and adults

Intervention: Tax on saturated fat

Comparison: No tax

Included studies: Saturated fat tax in Denmark.

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
Price change								
3	Non-RCTs	Very serious ¹	Not serious ²	Serious ³	Not serious ⁴	None	<i>Narrative analysis</i> only: 3 studies (102, 138, 139) reported increase in prices of targeted products (1 study without statistical testing). 1 study (102) reported a 13.1% increase in the price of butter; significance testing was not reported. 1 study (138) reported statistically significant increases in the price of butter (+11.38 kr/kg in discount stores; +8.17 kr/kg in supermarkets) and margarine (+6.18 kr/kg in discount stores; +4.57 kr/kg in supermarkets). 1 study (139) reported statistically significant increases ($P < 0.001$) in the price of high-fat varieties of minced beef (16%), regular cream (14%) and sour cream (13%).	⊕○○○ Very low
Purchases (direct effects)								
5	Non-RCTs	Very serious ⁵	Not serious ⁶	Serious ⁷	Not serious ⁸	None	<i>Narrative analysis</i> only: 3 studies (102, 140, 141) suggested a decrease in purchases of targeted products, but no statistical testing was reported. Of these, 1 study (140) reported a 0.9% decrease in the total volume purchased of 12 foods targeted by the tax; 1 study (102) reported a 5.5% decrease in butter purchases; and 1 study (141) reported a 4% decrease in purchasing of saturated fat. 1 study (139) reported statistically significant decreases in purchases of minced beef and cream products. 1 study (138) showed a statistically significant decrease in total weekly purchasing of fat products per individual (41.772 g; $P = 0.000$).	⊕○○○ Very low
Purchases (substitution effects)								
1	Non-RCT	Very serious ⁹	Serious ¹⁰	Serious ¹¹	Not serious ¹²	None	<i>Narrative analysis</i> only: mixed results for purchases of untaxed substitutes; results not statistically tested. A study (141) reported a 7.9% increase in purchasing of vegetables and a 3.7% increase in purchasing of fibre, but also an increase in purchasing of salt for some age and sex	⊕○○○ Very low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							groups and a decrease in purchasing of fruit for some age and sex groups; significance testing was not reported.	
Consumption (direct effects)								
0								
Consumption (substitution effects)								
0								
Diet (energy, total food and/or nutrient intake, nutritional quality)								
0								
Product change (portion size, food reformulation, portfolio mix)								
0								
Unintended consequences (cross-border shopping)								
0								
Unintended consequences (unemployment)								
0								
Unintended consequences (other)								
0								
Body weight status, body mass index								
0								
Diet-related NCDs (including validated surrogate indicators)								
0								
Undernutrition								
0								
Pregnancy outcomes								
0								

CI: confidence interval; kr: Danish krone; NCD: noncommunicable disease; RCT: randomized controlled trial; RoB: risk of bias.

Certainty of evidence is described as high ⊕⊕⊕⊕, moderate ⊕⊕⊕○, low ⊕⊕○○ or very low ⊕○○○.

Footnotes:

- Across the outcomes, the following rules were followed for judging the RoB: If 60% or more of studies contributing to the evidence of an outcome had a high RoB, the RoB rating for that outcome was "very serious". If 41–59% of studies had a high RoB, it was rated as "serious". If 40% or less of studies had a high RoB, it was rated as "not serious". For assessing the RoB for outcomes with a smaller number of studies (i.e. less than 5), additional details of the RoB assessment were considered for making the final judgement. For this outcome (price change), a total of 3 studies were included in the narrative analysis. Two interrupted time-series were included, and their RoB was assessed using the EPOC tool. One study (138) was assessed as having high RoB because the intervention was not assessed as being independent of other changes. The other study (139) was assessed as having low RoB. One before-and-after study was included, and its RoB was assessed using the EPOC tool. The study (102) was assessed as having high RoB because there was no baseline measurement, characteristics for studies using second site as control, protection against contamination, or follow-up. Low RoB: 1; high RoB: 2. Downgraded for RoB.

2. Not downgraded for inconsistency, as there were no variations in results. All results pointed to an increase in prices of taxed products assessed in the studies.
3. Evidence was from one setting, representing a single country context. Studies had poor alignment of products included in the assessment compared with target products of the tax. Products affected most by the tax were mainly assessed in the studies. Downgraded for indirectness.
4. Included studies had sufficiently large sample sizes (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period). Estimates showed either small effects or no effects. Not downgraded for imprecision.
5. Very serious RoB, because more than 60% of studies had a high RoB. Low RoB: 1; high RoB: 4 (80%). Downgraded for RoB.
6. Not downgraded for inconsistency, because effects of all but one study pointed to a decrease in purchases of taxed products assessed in the studies. One study showed mixed results.
7. Evidence was from one setting, representing a single country context. Downgraded for indirectness.
8. Included studies had sufficiently large sample sizes (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period). Estimates showed either small effects or no effects. Not downgraded for imprecision.
9. One interrupted time-series was included for this outcome, and its RoB was assessed using the EPOC tool. The study (141) was assessed as having high RoB because the intervention was not assessed as being independent of other changes. High RoB: 1. Downgraded for RoB.
10. Results were inconsistent, suggesting benefits favouring the intervention and the control, with no significance tests done or CIs provided. Downgraded for inconsistency.
11. Evidence was from one setting, representing a single country context. Downgraded for indirectness.
12. The included study had a sufficiently large sample size (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period). Estimates showed either small effects or no effects. No suspicion of imprecision.

Issues of interest of implementing a subsidy

Comparison: No subsidy

Included evaluated interventions: various vouchers for and discounts on fruit and vegetables for low-income households in the US; food vouchers for low-income pregnant women and low-income households in the UK; a subsidised fruit and vegetable box programme targeting low-income Aboriginal families with young children in Australia; discounted pulses and fortified wheat flour for eligible households in India; and the reduction of value-added tax (VAT) on fruits and vegetables in Latvia

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
Price change								
3	Non-RCTs	Very serious ¹	Not serious ²	Not serious ³	Serious ⁴	None	<p><i>Narrative analysis</i> only: 2 studies (142, 143) with mixed results across measures, most finding no statistically significant effects and 1 study (144) reporting a decrease in prices.</p> <p>1 study (144) of reduced VAT rate for some fresh fruit and vegetables in Latvia reported significantly lower price indices for Latvia than controls.</p> <p>1 US study (142) providing matching financial vouchers for the amount of SNAP benefits spent on fresh local produce reported a significant increase in price of yellow squash (0.02) and a significant decrease in price of russet potatoes (−1.51), but no significant change in price of tomatoes (0.35), peaches (−0.32), cantaloupes (−0.12), cucumbers (0.10), green bell peppers (0.03), zucchinis (−0.18), green cabbage (−0.01), cauliflower (−0.43), roma tomatoes (−0.28), sweet potatoes (0.00), turnip greens (−0.03), jalapeno peppers (−0.12) or red potatoes (0.19).</p> <p>1 US study (143) of fruit and vegetable prices at WIC vendors before and after the introduction of a fruit and vegetable voucher to WIC food packages found significantly decreased prices of canned vegetables (−0.15; SE 0.04; $P < 0.001$) and frozen vegetables (−0.64; SE 0.11; $P < 0.001$) but no significant change in price of fresh vegetables (0.10; SE 0.08; $P = 0.23$), fresh fruit (−0.02; SE 0.07; $P = 0.77$), canned fruit (−0.15; SE 0.11; $P = 0.18$) or frozen fruit (−0.03; SE 0.10; $P = 0.78$).</p>	⊕○○○ Very low
Purchases (direct effects)								

direct effects)

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
14	7 RCTs	Very serious ⁵	Not serious ⁶	Serious ⁷	Serious ⁸	None	<p><i>Meta-analysis</i> of 8 estimates from 6 studies: significant increase in purchases of subsidized fruit and vegetables, with PE of -0.79 (95% CI: -1.60 to 0.02); $I^2 = 85\%$.</p> <p><i>Narrative analysis</i>: 1 US study (145) reported that receiving a 30% rebate for purchasing targeted fruits and vegetables was associated with increased SNAP households' monthly spending on targeted fruits and vegetables by \$1.10 (SE 0.18; $P < 0.01$).</p>	⊕○○○ Very low
	7 non-RCTs	Not serious ⁹	Serious ¹⁰	Not serious ¹¹	Serious ¹²	None	<p><i>Meta-analysis</i> of 6 estimates from 4 studies: marginally significant increase in purchases of subsidized fruit and vegetables, with PE of -0.34 (95% CI: -0.74 to 0.05); $I^2 = 95\%$.</p> <p>Additional information (narrative analysis): a total of 3 studies (142, 146, 147) were included in the narrative analysis.</p> <p>2 studies reported significant increases in purchases of fruit and vegetables.</p> <p>1 UK study (146) reported that receiving vouchers for fresh fruits, vegetables and milk was associated with increased quantity of fruits and vegetables purchased by eligible households by 1.789 kg per month (SE 0.647; $P < 0.01$) and increased expenditure on fruits and vegetables by eligible households by £2.425 per month (SE 0.643; $P < 0.01$).</p> <p>1 US study (142) reported that a programme providing vouchers to match SNAP benefits that recipients spend on fresh local produce was associated with a marginally significant increase in produce purchases at participating grocery stores by 12.4% or \$843/week (SE not reported; $P < 0.10$) and quantities purchased by 16.3% or 632.14 units (SE not reported; $P < 0.10$).</p> <p>1 study found statistically significant increases in purchases of other subsidized products.</p> <p>1 study (147) of subsidies on pulses in selected Indian states reported a significant increase in total household purchases of all pulses per year (2.984 kg; SE 0.99).</p>	⊕○○○ Very low
Purchases (substitution effects)								
3	2 RCTs	Very serious ¹³	Not serious ¹⁴	Serious ¹⁵	Serious ¹⁶	None	<i>Narrative analysis</i> only: mixed results across measures in one study, and no effect in another study.	⊕○○○ Very low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							<p>1 US study (149) of financial incentives in a food benefit programme for low-income people found a significant difference in change in purchasing of SSBs between the incentive and control groups ($P < 0.05$), but no significant differences in other measures.</p> <p>1 US study (150) of a discount on qualifying fruit and vegetables reported no evidence of significant differences in purchasing of unhealthful food categories between the intervention and control groups.</p>	
	1 non-RCTs	Serious ¹⁷	Not serious ¹⁸	Not serious ¹⁹	Not serious ²⁰	None	<p><i>Narrative analysis only:</i></p> <p>1 US study (151) providing SNAP participants with a subsidy on fresh produce purchases reported no significant effect of the programme on spending on SSBs among SNAP participants.</p>	⊕○○○ Very low
Consumption (direct effects)								
17	5 RCTs	Very serious ²¹	Serious ²²	Serious ²³	Serious ²⁴	Publication bias suspected ²⁵	<p><i>Meta-analysis</i> of 4 estimates from 3 studies: no significant change in consumption of subsidized fruit and vegetables, with PE of -0.45 (95% CI: -1.50 to 0.59); $I^2 = 86\%$.</p> <p><i>Narrative analysis:</i> 2 studies for the same US-based intervention showed significantly higher consumption of targeted foods.</p> <p>1 US study (152) reported that a 30% incentive for purchases of targeted fruits and vegetables was associated with increased daily consumption of targeted fruits and vegetables by 24% or 0.22 cup-equivalents (SE 0.06; $P < 0.01$) 4–6 months after implementation.</p> <p>1 US study (153) reported that an incentive of 30 cents for every dollar of SNAP benefits spent on targeted fruits and vegetables was associated with increased daily consumption of targeted fruits and vegetables by 0.238 cup-equivalents (SE 0.054; $P < 0.01$).</p>	⊕○○○ Very low
	12 non-RCTs	Not serious ²⁶	Serious ²⁷	Not serious ²⁸	Not serious ²⁹	None	<p><i>Meta-analysis</i> of 5 estimates from 4 studies: no significant change in consumption of subsidized fruit and vegetables, with PE of -0.02 (95% CI: -0.20 to 0.15; $P = 0.72$); $I^2 = 57\%$.</p> <p>Additional information (narrative analysis)</p>	⊕○○○ Very low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							<p>7 US studies (154-160) assessed the impact of fruit and vegetable subsidies. 3 of these studies showed increased consumption of targeted products, and 4 studies reported no change.</p> <p>1 US study (154) reported that a subsidy for fresh fruit and vegetables for WIC participants was associated with increased servings of fruit and vegetables by 1.4 serves per 1000 kcal (SE 0.33; $P < 0.001$) for farmers market participants and by 0.81 serves per 1000 kcal (SE 0.34; $P = 0.02$) for supermarket participants.</p> <p>1 US study (155) reported that an incentive to government nutrition assistance recipients to purchase fresh produce at farmers markets was associated with an increased percentage of respondents who reported eating 5 or more daily serves of fruits and vegetables, from 19.4% at baseline to 24.2% at 12 months ($P < 0.001$).</p> <p>1 US study (156) reported that a dollar-for-dollar match of SNAP dollars spent at farmers markets was associated with increased median frequency of fruit and vegetable consumption by 0.47 times per day (SE not reported).</p> <p>1 US study (157) reported that a dollar-for-dollar farmers market match incentive was associated with no significant change in total fruit and vegetable consumption.</p> <p>1 US study (158) reported that farmers market coupons for WIC participants were associated with no significant change in overall consumption of fresh produce.</p> <p>1 US study (159) reported that cash value vouchers for fruit and vegetables for WIC participants were associated with no significant change in fruit and vegetable consumption.</p> <p>1 US study (160) reported that a farmers market incentive programme was associated with no significant change in fruit and vegetable consumption.</p> <p>1 study (147) reported statistically significant increases in consumption of other subsidized products:</p> <p>1 study (147) of subsidies on pulses in selected Indian states reported a significant increase in consumption of all pulses per household per month (0.296 kg; SE 0.11; $P < 0.05$).</p>	
Consumption (substitution effects)								

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
4	3 RCTs	Very serious ³⁰	Serious ³¹	Serious ³²	Not serious ³³	None	<p><i>Narrative analysis</i> only: 3 studies (153, 163, 164) showed mixed results.</p> <p>A US study (153) of an incentive to make fruits and vegetables more affordable for SNAP participants found significantly decreased consumption of refined grains (–0.429 oz-eq; SE 0.135; $P = 0.002$) and solid fats (–1.69 gm-eq; SE 0.68; $P = 0.097$) and increased consumption of alcohol (0.077; SE 0.035; $P = 0.027$), but no significant difference in whole grains (–0.016 oz-eq; SE 0.039; $P = 0.688$), total dairy (0.020 cup-eq; SE 0.060; $P = 0.740$), total protein foods (–0.028 oz-eq; SE 0.155; $P = 0.857$), oil (–0.96 gm-eq; SE 0.68; $P = 0.160$) or added sugars (–0.63 tsp; SE 0.64; $P = 0.324$).</p> <p>A US study (163) incentivizing the purchase of fruits and vegetables in a food benefit programme found a significant difference in change in SSB consumption between the incentive and control arms ($P < 0.05$), but no significant difference in other measures.</p> <p>A US study (164) of an incentive that offered rebates to SNAP participants for purchasing targeted fruit and vegetables found a statistically significant decrease in refined grains (–0.43 oz-eq/d; 95% CI: –0.69 to –0.16; $P = 0.002$) and increase in alcoholic beverages (0.08 drinks/d; 95% CI: 0.01 to 0.15; $P = 0.027$), but no significant difference in whole grains (–0.02 oz-eq/d; 95% CI: –0.09 to 0.06; $P = 0.688$), total dairy (0.02 cup-eq/d; 95% CI: –0.10 to 0.14; $P = 0.740$), total protein foods (–0.03 oz-eq/d; 95% CI: –0.33 to 0.28; $P = 0.857$), oils (–1.0 g-eq/d; 95% CI: –2.3 to 0.4; $P = 0.160$), solid fats (–1.7 g-eq/d; 95% CI: –3.7 to 0.3; $P = 0.097$) or added sugars (–0.6 tsp/d; 95% CI: –1.9 to 0.6; $P = 0.324$).</p>	⊕○○○ Very low
	1 non-RCTs	Not serious ³⁴	Not serious ³⁵	Serious ³⁶	Not serious ³⁷	None	<p><i>Narrative analysis:</i></p> <p>A US study (165) of a fruit and vegetable exposure/incentive targeting families receiving US federal food assistance found a significant 24.6% decrease (SE 10.5; $P = 0.005$) in times per day consuming soda.</p>	⊕○○○ Very low
Diet (energy, total food and/or nutrient intake, nutritional quality)								
5	3 RCTs	Very serious ³⁸	Not serious ³⁹	Serious ⁴⁰	Not serious ⁴¹	None	<p><i>Narrative analysis:</i></p> <p>1 study, published as 2 papers (153, 164), one (164) of which found a statistically significant increase in dietary</p>	⊕○○○ Very low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							<p>quality and the other (153) mixed results. 1 study (163) found no change in diet quality.</p> <p>The US study (with 2 papers) of an incentive to make fruits and vegetables more affordable for SNAP participants found a significant increase in Healthy Eating Index-2010 score (4.7; 95% CI: 2.4 to 7.1; $P < 0.001$), and a significant increase in vitamin C intake (14 mg; SE 4; $P = 0.001$), but no significant difference in intake of total energy (–49 kcal; SE 38; $P = 0.201$), fibre (0.38 g; SE 0.33; $P = 0.258$), beta carotene (193 mcg; SE 121; $P = 0.112$) or vitamin A (15 mcg retinol activity equivalents; SE 24; $P = 0.528$).</p> <p>1 US study (163) incentivizing the purchase of fruits and vegetables in a food benefit programme found no significant difference in change in Healthy Eating Index-2010 score between the incentive and the control arm.</p>	
	2 non-RCTs	Not serious ⁴²	Not serious ⁴³	Serious ⁴⁴	Serious ⁴⁵	None	<p><i>Narrative analysis</i> only: 1 study (166) of a fruit and vegetable subsidy for disadvantaged Australian Aboriginal children reported no significant differences in adjusted intake of macronutrients per MJ/d for protein (0.1 g; 95% CI: –0.6 to 0.9), total fat (0.5 g; 95% CI: 0.1 to 0.9), saturated fat (0.2 g; 95% CI: –0.1 to 0.4), carbohydrate (–1.2 g; 95% CI: –2.5 to 0.1), total sugar (–1.0 g; 95% CI: –2.4 to 0.4), added sugar (0.03 g; 95% CI: –1.4 to 1.5) or starch: (–0.2 g; 95% CI: –1.6 to 1.2).</p> <p>1 study (147) of subsidies on pulses in selected Indian states reported a significant increase in pulse protein intake per day per household (1.383 g; SE 0.67; $P < 0.05$).</p>	⊕○○○ Very low
Product changes (portion size, food reformulation, portfolio mix)								
0								
Unintended consequences (cross-border shopping)								
0								
Unintended consequences (unemployment)								
0								
Unintended consequences (other)								
0								
Body weight status, BMI								
2	1 RCT	Very serious ⁴⁶	Not serious ⁴⁷	Serious ⁴⁸	Serious ⁴⁹	None	<p><i>Narrative analysis</i> only: no significant change in BMI measures.</p>	⊕○○○ Very low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							1 US study (163) incentivizing the purchase of fruit and vegetables reported no significant difference in change in BMI between the incentive group and the control group.	
	1 non-RCTs	Not serious ⁵⁰	Not serious ⁵¹	Serious ⁵²	Serious ⁵³	None	<p><i>Narrative analysis</i> only: no significant change in BMI measures.</p> <p>1 before-and-after study (167) of a subsidized fruit and vegetable programme for Aboriginal children in northern New South Wales, Australia, reported no significant change in the percentage of children in each weight category (underweight, normal weight, overweight, obese) ($P = 0.721$).</p>	⊕○○○ Very low
Diet-related NCDs (including validated surrogate indicators)								
0								
Undernutrition								
4	Non-RCT	Not serious ⁵⁴	Not serious ⁵⁵	Not serious ⁵⁶	Serious ⁵⁷	None	<p><i>Narrative analysis</i> only:</p> <p>1 study (167) of a subsidized fruit and vegetable programme for Aboriginal children in northern New South Wales, Australia, reported a significant difference in adjusted mean haemoglobin (3.1 g/L; 95% CI: 1.4 to 4.8; $P < 0.05$) but no significant differences in adjusted mean ferritin (1.7 µg/L; 95% CI: -2.5 to 6.0) or adjusted mean iron (0.8 µmol/L; 95% CI: -0.5 to 2.0).</p> <p>1 study (166) of a subsidized fruit and vegetable programme for Aboriginal children in northern New South Wales, Australia, reported on biomarkers for fruit and vegetable intake, and found significant increases in 3 out of 9 examined biomarkers (b-cryptoxanthin (28.9 nmol/l; 18%), vitamin C (10.1 mmol/l; 21%) and lutein-zeaxanthin (39.3 nmol/l; 11%)) at 12-month follow-up.</p> <p>1 study (168) of a subsidized fruit and vegetable programme for Aboriginal children in northern New South Wales, Australia, reported a significant increase in the mean red blood cell folate z-score (0.55; 95% CI: 0.36 to 0.74) for children.</p> <p>1 study (169) of a food-based safety net programme involving the provision of fortified wheat flour in India found no significant impact on haemoglobin (-0.184; $P = 0.793$) or anaemia (-0.01; $P = 0.859$) in Punjab, and</p>	⊕○○○ Very low

Quality assessment							Impact	Certainty
No. of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
							no significant impact on haemoglobin (−0.001; $P = 0.998$) and a significant impact on anaemia (−0.08; $P = 0.042$) in Tamil Nadu.	
Pregnancy outcomes								
0								

BMI: body mass index; CI: confidence interval; eq: equivalent; NCD: noncommunicable disease; OR: odds ratio; PE: price elasticity; RCT: randomized controlled trial; RoB: risk of bias; SE: standard error; SNAP: Supplemental Nutrition Assistance Program; SSB: sugar-sweetened beverage; tsp: teaspoon; UK: United Kingdom; US: United States of America; VAT: value-added tax; WIC: Special Supplemental Nutrition Program for Women, Infants, and Children.

Certainty of evidence is described as high ⊕⊕⊕⊕, moderate ⊕⊕⊕○, low ⊕⊕○○ or very low ⊕○○○.

Footnotes:

- Across the outcomes, the following rules were followed for judging the RoB: If 60% or more of studies contributing to the evidence of an outcome had a high RoB, the RoB rating for that outcome was “very serious”. If 41–59% of studies had a high RoB, it was rated as “serious”. If 40% or less of studies had a high RoB, it was rated as “not serious”. For assessing the RoB for outcomes with a smaller number of studies (i.e. less than 5), additional details of the RoB assessment were considered for making the final judgement. For all outcomes for which meta-analyses were conducted, the overall RoB was assessed for only those studies included in the meta-analysis. For this outcome (price change), a total of 3 studies were included in the narrative analysis. Of the three included studies, two were assessed with a high RoB and one with an unclear RoB using the EPOC tool. The interrupted time-series (143) was assessed as having high RoB because the intervention was not assessed as being independent of other changes. Two controlled before-and-after studies were included for this outcome, and their RoB was assessed using the EPOC tool. One study (144) was assessed as having high RoB because there was not blinded assessment of primary outcome(s). The other study (142) was assessed as having unclear RoB because it was unclear whether the study protected against detection bias. Downgraded twice for RoB.
- Estimates showed either no effect or beneficial effects (i.e. a decrease in prices for fruits and vegetables). Only one estimate for one vegetable showed an increase in price. Not downgraded for inconsistency.
- There was no suspicion of indirectness. Not downgraded for indirectness.
- In two of three studies, sample sizes appeared insufficient (e.g. $n < 500$ individuals per site/time period, or store audits $n < 50$ per site/time period). No CIs provided. Downgraded for imprecision.
- Very serious RoB, because more than 60% of studies had a high RoB. Low RoB: 1; high RoB: 5 (71%); unclear RoB: 1. Downgraded twice for RoB.
- We did not downgrade for inconsistency. Results showed a high level of heterogeneity ($I^2 = 85\%$ for PE), which was introduced by one study with two very large effect estimates (149). All other studies showed small to large beneficial effects.
- Evidence on the impact of a fruit and vegetable subsidy was from one setting, representing a single country context. Downgraded for indirectness.
- We downgraded for imprecision because the CI of the PE included values from a large effect to no effect (95% CI: −1.60 to 0.02).
- No serious RoB because 40% or less of studies had a high RoB. Low RoB: 2; fair quality: 1; high RoB: 2 (28%); unclear RoB: 2. Not downgraded for RoB.
- We downgraded for inconsistency, because results showed a high level of heterogeneity ($I^2 = 95\%$ for PE), and no subgroup effects explained the heterogeneity.
- There was no suspicion of indirectness. Not downgraded for indirectness.
- We downgraded for imprecision because the CI of the PE included values that showed a large effect, no effect or trivial effects (95% CI: −0.74 to 0.05).
- Two RCTs were included for this outcome, and their RoB was assessed using the RoB2 tool. One study (149) was assessed as having high RoB due to lack of allocation concealment and blinding of participants. The other study (150) was assessed as having high RoB due to lack of random sequence generation and allocation concealment, and incomplete outcome data. Downgraded twice for RoB.
- One study with two estimates reported inconsistent results, favouring the intervention and the control. One study showed no effect. Not downgraded for inconsistency.
- Evidence on the impact of a fruit and vegetable subsidy was from one setting, representing a single country context. Downgraded for indirectness.
- Two included studies appear to have insufficient sample sizes (i.e. $n < 500$ individuals per site/time period, or store audits $n < 50$ per site/time period). No CIs provided. Downgraded for imprecision.

17. One controlled before-and-after study was included for this outcome, and its RoB was assessed using the EPOC tool. The study (151) was assessed as having high RoB because there was no protection against contamination. Downgraded for RoB.
18. Results of one study suggested no effect. Not downgraded for inconsistency.
19. There was no suspicion of indirectness. Not downgraded for indirectness.
20. The included study appeared to have a sufficiently large sample size (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period). CIs provided included values suggesting beneficial effects. Not downgraded for imprecision.
21. Very serious RoB, because more than 60% of studies had a high RoB. High RoB: 5 (100%). Downgraded twice for RoB.
22. We downgraded for inconsistency, because results showed a high level of heterogeneity ($I^2 = 86\%$ for PE), and no subgroup effects were identified.
23. Evidence on the impact of a fruit and vegetable subsidy was from one setting, representing a single country context. Downgraded for indirectness.
24. We downgraded for imprecision because the CI of the PE included values from a large effect to a trivial effect (95% CI: -1.50 to 0.59).
25. The Egger test was conducted to test for publication bias in meta-analysed studies. The result of the Egger test was significant ($P = 0.047$), suggesting publication bias.
26. No serious RoB, because 40% or less of studies had a high RoB. Low RoB: 2; high RoB: 4 (33%); unclear RoB: 2; fair quality: 4. Not downgraded for RoB.
27. We downgraded for inconsistency, because results showed a high level of heterogeneity ($I^2 = 57\%$ for PE), and no subgroup effects were identified.
28. Not downgraded for indirectness.
29. We did not downgrade for imprecision because the CI of the PE included values that were consistent with no effect or a trivial effect (95% CI: -0.20 to 0.15).
30. Three RCTs were included for this outcome, and their RoB was assessed using the ROB2 tool. One study (163) was assessed as having high RoB due to lack of allocation concealment and binding of participants. Another study (164) was assessed as having high RoB due to incomplete outcome data. Another study (153) was assessed as having high RoB due to incomplete outcome data. High RoB: 3. Downgraded twice for RoB.
31. Results were inconsistent, suggesting benefits favouring the intervention and the control. Downgraded for inconsistency.
32. Evidence on the impact of a fruit and vegetable subsidy was from one setting, representing a single country context. Downgraded for indirectness.
33. Three of the four studies appeared to have sufficient sample sizes (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period). CIs provided included values suggesting no effect or small effects. Not downgraded for imprecision.
34. One cohort study was included for this outcome, and its RoB was assessed using the NOS tool. The study (165) was assessed as having fair quality. Not downgraded for RoB.
35. Results of study suggested a small beneficial effect favouring the intervention. Not downgraded for inconsistency.
36. One study assessing impact of a fruit and vegetable subsidy was from one setting, representing a single country context. Downgraded for indirectness.
37. The included study appeared to have sufficient sample sizes (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period). No CIs provided. Not downgraded for imprecision.
38. Three RCTs were included for this outcome, and their RoB was assessed using the ROB2 tool. One study (163) was assessed as having high RoB due to lack of allocation concealment and blinding of participants. Another study (164) was assessed as having high RoB due to incomplete outcome data. Another study (153) was assessed as having high RoB due to incomplete outcome data. High RoB: 3. Downgraded twice for RoB.
39. Estimates showed either no effect or beneficial effects (i.e. a statistically significant increase in dietary quality, measured using the Healthy Eating Index). Not downgraded for inconsistency.
40. Evidence on the impact of a fruit and vegetable subsidy was from one setting, representing a single country context. Downgraded for indirectness.
41. The two included studies appeared to have sufficient sample sizes (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period). One provided CI suggested benefits favouring the intervention (i.e. a significant increase in Healthy Eating Index-2010 score; 95% CI: 2.4 to 7.1). Not downgraded for imprecision.
42. Two non-RCTs were included for this outcome. One controlled before-and-after study was included for this outcome, and its RoB was assessed using the EPOC tool. The study (147) was assessed as having unclear RoB because it was not clear whether the study protected against contamination. The cohort study included for this outcome was assessed using the NOS tool. The study (166) was assessed as being of fair quality. Not downgraded for RoB.
43. One study showed no effect. The other study reported a positive effect on dietary intake (increase in pulse protein intake per day per household). Not downgraded for inconsistency.
44. One of the two studies (147) used assumptions to rescale coefficient estimates. Downgraded for indirectness.
45. One of the two included studies appeared to have sufficiently large sample sizes (i.e. $n > 500$ individuals per site/time period, or store audits $n > 50$ per site/time period). No CIs provided. The other study appeared to have insufficient sample sizes (i.e. $n < 500$ individuals per site/time period, or store audits $n < 50$ per site/time period). The CIs provided in that study included values suggesting benefits favouring the intervention and the control (e.g. adjusted intake of added sugars; 95% CI: -1.4 to 1.5). Downgraded for imprecision.
46. One RCT was included for this outcome, and its RoB was assessed using the ROB2 tool. The study (163) was assessed as having high RoB due to lack of allocation concealment and blinding of participants. High RoB: 1. Downgraded twice for RoB.
47. One study showed no effect. Not downgraded for inconsistency.
48. Evidence on the impact of a fruit and vegetable subsidy was from one setting, representing a single country context. Downgraded for indirectness.

49. The included study appeared to have insufficient sample sizes (i.e. $n < 500$ individuals per site/time period, or store audits $n < 50$ per site/time period). No CIs provided. Downgraded for imprecision.
50. One cohort study was included for this outcome, and its RoB was assessed using the NOS tool. The study (167) was assessed as having fair quality. Not downgraded for RoB.
51. The included study showed no effect. Not downgraded for inconsistency.
52. One study assessing impact of a fruit and vegetable subsidy was from one setting, representing a single country context. Downgraded for indirectness.
53. The included study appeared to have insufficient sample sizes (i.e. $n < 500$ individuals per site/time period, or store audits $n < 50$ per site/time period). No CIs provided. Downgraded for imprecision.
54. Three cohort studies were included for this outcome, and their RoB was assessed using the NOS tool. The studies (166-168) were assessed as having fair quality. The other study (169) – a controlled before-and-after study – was assessed using the EPOC tool as having low RoB. Not downgraded for RoB.
55. Estimates showed either no effect or a small beneficial effect (i.e. significant increase in mean haemoglobin). Not downgraded for inconsistency.
56. There was no suspicion of indirectness. Not downgraded for indirectness.
57. One of the two included studies appeared to have insufficient sample sizes (i.e. $n < 500$ individuals per site/time period, or store audits $n < 50$ per site/time period). Only one study reported a CI (for adjusted mean ferritin; 95% CI: -2.5 to 6.0), which includes values suggesting benefits favouring the intervention and the control. Downgraded for imprecision.

Annex 7: Evidence to decision: summary of judgements⁵¹

Should a policy for a tax on sugar-sweetened beverages versus no such policy be used for adults and children?

Characteristic of policy	Question	Judgement	Rationale
Desirable effects	How substantial are the desirable anticipated effects?	Large	<p><i>Research evidence</i> “Outcomes following taxation of sugar-sweetened beverages: a systematic review and meta-analysis” (27)</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • The size of the desirable effects of the intervention depends on policy design elements, particularly the tax rate. A tax with a higher tax rate will produce larger effects. • As food environment policies are complex interventions, with myriad factors influencing the outcomes of interest (due to confounders and methodological constraints), there is a need to be realistic about the extent to which any one intervention can be expected to affect the long-term outcomes of interest on its own. • Although real-life policy evaluations are limited in their study design, the methods used in the included literature are among the most robust that can be used to infer causation from observational data. • Importantly, the evidence is not based on a set of independent outcomes but on a hierarchy of outcomes. If the tax has an effect

⁵¹ This annex includes evidence to decision tables for the three recommendations made in this guideline on fiscal policies. After reviewing the evidence on a single nutrient tax, which included data from one country’s tax policy, the NUGAG Subgroup on Policy Actions agreed that evidence was insufficient to formulate a recommendation for a single nutrient tax. It was noted, however, that a single nutrient tax (i.e. on saturated fatty acids) may increase prices and reduce purchases of taxed products. In implementing such a tax, it is important to consider a likely broad range of taxable products that may include both foods that fall into a discretionary food category and foods that contribute to a healthy diet.

Characteristic of policy	Question	Judgement	Rationale
			<p>on price increases, it can have an effect on purchases, and then on consumption and on overall diet.</p> <ul style="list-style-type: none"> • For the decision-making process, the proxies of price change and purchase were considered acceptable. Effects on consumption might not be seen because of dilutional effects of the evidence. • Consumption data were considered less reliable. As purchase data were mainly from store scanner data, these data were considered more reliable and likely to translate to consumption.
Undesirable effects	How substantial are the undesirable anticipated effects?	Small	<p><i>Research evidence</i> “Outcomes following taxation of sugar-sweetened beverages: a systematic review and meta-analysis” (27)</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • Evidence did not show undesirable health effects. • Undesirable effects on cross-border shopping were considered small.
Certainty of evidence	What is the overall certainty of the evidence of effects?	Moderate	<p><i>Research evidence</i> GRADE evidence profiles (Annex 6)</p> <p><i>Additional considerations</i></p> <ul style="list-style-type: none"> • Taking into account the justifications provided under “Desirable effects”, the judgement on the overall certainty of evidence was made considering evidence for the outcomes of price change and purchases, which were considered critical for a decision about the size of the desired effect and certainty of evidence.
Values	Is there important uncertainty about, or variability in, how much people value the main outcomes?	Probably no important uncertainty or variability	<p><i>Research evidence</i> A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to values (29).</p> <p><i>Additional considerations</i></p>

Characteristic of policy	Question	Judgement	Rationale
			<ul style="list-style-type: none"> Judgement was made on values relating to diet-related health outcomes, such as overweight/obesity and diet-related NCDs, rather than values relating to price of foods. Values relating to the intervention of interest were discussed under “acceptability to the public”.
Balance of effects	Does the balance between desirable and undesirable effects favour the intervention or the comparison?	Favours the intervention	<p><i>Research evidence</i> “Outcomes following taxation of sugar-sweetened beverages: a systematic review and meta-analysis” (27), and a review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to values (29).</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> Based on large desirable and small undesirable effects, a moderate certainty of evidence and probably no important uncertainty or variability in values, the judgement was made that the balance of effects of implementing the intervention would favour the intervention. The effect of a tax is highly dependent on tax design. If poorly designed (including a trivially small tax rate), a tax may bring no or only marginal health benefits. However, no SSB tax was identified that led to undesirable health effects.
Resources required	How large are the resource requirements (costs)?	Negligible costs	<p><i>Research evidence</i> A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to resources required (29).</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> The costs considered should be those to the government and not to other actors (e.g. industry).

Characteristic of policy	Question	Judgement	Rationale
			<ul style="list-style-type: none"> The judgement of negligible costs does not reflect revenue collected through a tax, as this is considered a transfer payment that does not appear in the cost equation. Many of the costs of a tax are one-off costs incurred when setting up a tax, and the ongoing costs are likely to be minimal. Compared with other policy measures to promote healthy diets, resources required for implementing an SSB tax were judged to be negligible. Tax administration costs are typically measured as a proportion of revenue generated. As evidence indicates that SSB taxes do not have higher administration costs than other taxes, and given evidence of the revenue generated by such taxes, the tax administration costs are likely to be minimal. Taxes can generate revenue that can be earmarked for other health purposes.
Cost-effectiveness	Does the cost-effectiveness of the intervention favour the intervention or the comparison?	Favours the intervention	<p><i>Research evidence</i></p> <p>A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to cost-effectiveness (29).</p> <p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> Multiple modelling studies are available that assess cost-effectiveness. The judgement that cost-effectiveness favours the intervention was based on identified modelling studies.
Equity	What would be the impact on health equity?	Increased	<p><i>Research evidence</i></p> <p>“Outcomes following taxation of sugar-sweetened beverages: a systematic review and meta-analysis” (27), and a review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to equity (29).</p>

Characteristic of policy	Question	Judgement	Rationale
			<p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • Equity concerns of an SSB tax are a potential concern for governments. Expenditures due to increased prices are perceived to weigh most heavily on incomes of people with low SES, although these people are likely to benefit more from the intervention than others in terms of health benefits. • The judgement on the impact of SSB taxes on equity was therefore based on the progressivity of health benefits rather than financial regressivity (which is further discussed under “Acceptability”). • Studies identified for the review of contextual factors pointed to a favourable impact on equity. Quantitative subgroup analyses by SES were not possible in the systematic review as a result of insufficient disaggregated data. Narrative analysis showed mixed findings on the impact of an SSB tax on equity.
Human rights	What would be the impact on human rights?	Probably increased	<p><i>Research evidence</i></p> <p>A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to human rights (29).</p> <p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • Although a tax on SSBs may restrict the choice of some people, it conversely improves public health in a more equitable way. • Information on the impact on human rights was taken from human rights texts, including reports by Special Rapporteurs on the right to health, who recommend that, with a view to respect, protect and fulfil the right to health, governments “increase availability and accessibility of healthier food alternatives through fiscal ... policies that discourage production of unhealthy foods”.

Characteristic of policy	Question	Judgement	Rationale
Acceptability	Is the intervention acceptable to key actors?	Varies	<p><i>Research evidence</i></p> <p>A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to acceptability (29).</p> <p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • Industry was considered a key stakeholder for SSB tax implementation. • Revenue, particularly its use, influences acceptability, especially to the public. • Country experience has shown overwhelming public support for a tax. • Acceptability can be influenced by the media. • Based on country experience, acceptability varies over time and may increase once a tax is implemented; this was seen in opinion polls conducted after implementation of the SSB tax in the United Kingdom. • The judgement “varies” reflects the variability between and within stakeholder groups.
Feasibility	Is the intervention feasible to implement?	Yes	<p><i>Research evidence</i></p> <p>A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to feasibility (29).</p> <p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • Feasibility depends on country context (including existing tax infrastructure). In view of implemented SSB taxes, including in LMICs, the intervention is feasible.

Characteristic of policy	Question	Judgement	Rationale
			<ul style="list-style-type: none"> Poor policy framing may limit feasibility of the policy and leave it vulnerable to criticism. The intent behind the tax needs to be clearly defined. It is important to be prepared for opposition to ensure that this does not limit feasibility.

Should a policy for a tax on foods versus no such policy be used for adults and children?

Characteristic of policy	Question	Judgement	Rationale
Desirable effects	How substantial are the desirable anticipated effects?	Don't know	<p><i>Research evidence</i> "Evaluation of economic and health outcomes associated with food taxes and subsidies: a systematic review and meta-analysis" (28)</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> Theoretically, there is potential for taxes to have a desirable public health effect, but the evidence base from real-world policy evaluations is limited, reflecting the vote "don't know". The evidence from the systematic review does not allow a judgement on desirable effects. However, based on evidence from modelling studies, taxes – if well designed – would be expected to have a desirable and large effect (32-34).
Undesirable effects	How substantial are the undesirable anticipated effects?	Don't know	<p><i>Research evidence</i> "Evaluation of economic and health outcomes associated with food taxes and subsidies: a systematic review and meta-analysis" (28)</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> There is insufficient evidence to judge whether a food tax would have undesirable effects.

Characteristic of policy	Question	Judgement	Rationale
Certainty of evidence	What is the overall certainty of the evidence of effects?	Very low	<p><i>Research evidence</i> GRADE evidence profiles (Annex 6)</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> Evidence is limited for all outcomes. Consistent with the remarks under recommendation 1 on SSB taxes, the judgement was made considering evidence for the critical outcomes of price change and purchases.
Values	Is there important uncertainty about, or variability in, how much people value the main outcomes?	Probably no important uncertainty or variability	<p><i>Research evidence</i> A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to values (29).</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> The judgement was made on values relating to diet-related health outcomes, such as overweight/obesity and diet-related NCDs, rather than values relating to prices of foods. Values relating to the intervention of interest were discussed under “acceptability to the public”.
Balance of effects	Does the balance between desirable and undesirable effects favour the intervention or the comparison?	Probably favours the intervention	<p><i>Research evidence</i> “Evaluation of economic and health outcomes associated with food taxes and subsidies: a systematic review and meta-analysis” (28)</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> Although the systematic review provided limited evidence on desirable and undesirable effects, the judgement reflects the indirect evidence, including from modelling studies. Based on expert judgement, the balance of effects of a food tax policy, if well designed, is likely to favour the intervention.

Characteristic of policy	Question	Judgement	Rationale
Resources required	How large are the resource requirements (costs)?	Negligible costs	<p><i>Research evidence</i></p> <p>A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to resources required (29).</p> <p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • The costs considered should be those to the government and not to other actors (e.g. industry). • The judgement of negligible costs does not reflect revenue collected through a tax, as this is considered transfer payment that does not appear in the cost equation. • Many of the costs of a tax are one-off costs incurred when setting up a tax, and the ongoing costs are likely to be minimal. • Compared with other policy measures to promote healthy diets, resources required for implementing a food tax were judged to be negligible. Compliance costs to industry may be higher for more complex tax structures. • Tax administration costs are typically measured as a proportion of revenue generated. As evidence indicates that SSB taxes do not have higher tax administration costs than other taxes, and given evidence of the revenue generated by such taxes, the tax administration costs are likely to be minimal. • Taxes can generate revenue that can be earmarked for other health purposes.
Cost-effectiveness	Does the cost-effectiveness of the intervention favour the intervention or the comparison?	Probably favours the intervention	<p><i>Research evidence</i></p> <p>A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to cost-effectiveness (29).</p> <p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p>

Characteristic of policy	Question	Judgement	Rationale
			<ul style="list-style-type: none"> Modelling studies are available that assess cost-effectiveness (32). The judgement that cost-effectiveness favours the intervention was based on identified modelling studies.
Equity	What would be the impact on health equity?	Probably increased	<p><i>Research evidence</i> A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to equity (29).</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> Equity concerns of a food tax, similar to SSB taxes, are a potential concern for governments. Expenditures due to increased prices are perceived to weigh most heavily on incomes of people with low SES, although these people are likely to benefit from more from the intervention than others in terms of health benefits. The judgement on the impact of food taxes on equity was based on evidence from modelling studies.
Human rights	What would be the impact on human rights?	Probably increased	<p><i>Research evidence</i> A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to human rights (29).</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> Although a food tax may restrict the choice of some people, it conversely improves public health in a more equitable way. Information on the impact on human rights was taken from human rights texts, including reports by Special Rapporteurs on the right to health, who recommend that, with a view to respect, protect and fulfil the right to health, governments “increase availability and accessibility of healthier food alternatives through fiscal ... policies that discourage production of unhealthy foods”.

Characteristic of policy	Question	Judgement	Rationale
Acceptability	Is the intervention acceptable to key actors?	Varies	<p><i>Research evidence</i> A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to acceptability (29).</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • Evidence is limited on acceptability of food taxes. • The judgement “varies” reflects the variability between and within stakeholder groups.
Feasibility	Is the intervention feasible to implement?	Probably yes	<p><i>Research evidence</i> A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to feasibility (29).</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • Compared with a tax on SSBs, a tax on foods was considered to be more difficult to implement with regard to controlling potential substitution and defining the taxable products, and there are likely to be more ways to manipulate products to avoid taxation. • Nutrient profile models could help to overcome the difficulties in applying taxes. • There are broader cultural considerations for food taxes, which may impact feasibility. • Governments already implement very complex tax systems and are competent in defining products that will be taxed.

Should a policy for a subsidy on healthier foods versus no such policy be used for adults and children?

Characteristic of policy	Question	Judgement	Rationale
Desirable effects	How substantial are the desirable anticipated effects?	Varies	<p><i>Research evidence</i> “Evaluation of economic and health outcomes associated with food taxes and subsidies: a systematic review and meta-analysis” (28)</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • The evidence appears to indicate desirable effects, but the size of these effects is not clear. • Unlike taxes, the target population for subsidies varied substantially in the included studies, and it is possible that the size of the desirable effects varies depending on the target population. • There may be additional desirable non-health effects of subsidies, including increased retail revenue for farmers, particularly if a subsidy programme also has the goal of improving the income of local farmers.
Undesirable effects	How substantial are the undesirable anticipated effects?	Don't know	<p><i>Research evidence</i> “Evaluation of economic and health outcomes associated with food taxes and subsidies: a systematic review and meta-analysis” (28)</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • Evidence from the systematic review was insufficient to make a judgement. • Some modelling studies suggest that the prices of subsidized products may be increased for those not eligible for subsidies and the prices of unsubsidized, less healthy foods may be reduced. • Experience from a lunch programme in the United Kingdom showed that money saved on subsidized products may be used to purchase less healthy products.

Characteristic of policy	Question	Judgement	Rationale
Certainty of evidence	What is the overall certainty of the evidence of effects?	Very low	<p><i>Research evidence</i> GRADE evidence profiles (Annex 6)</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> Evidence was limited for all outcomes. Consistent with the remarks under recommendations 1 and 2 on taxes on SSBs and foods, the judgement was made considering evidence for the critical outcomes of price change and purchases.
Values	Is there important uncertainty about, or variability in, how much people value the main outcomes?	Probably no important uncertainty or variability	<p><i>Research evidence</i> A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to values (29).</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> The judgement was made on values relating to diet-related health outcomes, such as overweight/obesity and diet-related NCDs, rather than values relating to prices of foods. Values relating to the intervention of interest were discussed under “acceptability to the public”.
Balance of effects	Does the balance between desirable and undesirable effects favour the intervention or the comparison?	Probably favours the intervention	<p><i>Research evidence</i> Fiscal policies for foods: a systematic review and meta-analysis (28).</p> <p><i>Additional considerations</i> The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> The benefits are likely to outweigh the costs, although desirable effects may vary.
Resources required	How large are the resource requirements (costs)?	Moderate costs	<p><i>Research evidence</i> A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to resources required (29).</p>

Characteristic of policy	Question	Judgement	Rationale
			<p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • The resources required are likely to be moderate, compared with those for implementing a tax (which were considered negligible). • The resources required will vary, depending on the context and the size of the target population. • Although there was consensus on judging the costs as being moderate, four NUGAG members selected “varies” as the judgement. • Subsidies can have a high administrative burden, and the resources required will be ongoing.
Cost-effectiveness	Does the cost-effectiveness of the intervention favour the intervention or the comparison?	Probably favours the intervention	<p><i>Research evidence</i></p> <p>A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to cost-effectiveness (29).</p> <p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • Much of the evidence was based on modelling studies, which estimated subsidies to be cost-effective.
Equity	What would be the impact on health equity?	Probably increased	<p><i>Research evidence</i></p> <p>A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to equity (29).</p> <p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> • Because most of the included subsidies had an explicit focus on health equity, as they targeted people with lower SES, the intervention probably increases health equity.

Characteristic of policy	Question	Judgement	Rationale
Human rights	What would be the impact on human rights?	Probably increased	<p><i>Research evidence</i></p> <p>A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to human rights (29).</p> <p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> Information on the impact on human rights was taken from human rights texts, including reports by Special Rapporteurs on the right to health, who recommend that, with a view to respect, protect and fulfil the right to health, governments “increase availability and accessibility of healthier food alternatives through fiscal ... policies that discourage production of unhealthy foods”.
Acceptability	Is the intervention acceptable to key actors?	Probably yes	<p><i>Research evidence</i></p> <p>A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to acceptability (29).</p> <p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> Although subsidies were generally perceived to be acceptable, acceptability, especially among policy-makers, may vary depending on the political context and the design of the subsidy.
Feasibility	Is the intervention feasible to implement?	Probably yes	<p><i>Research evidence</i></p> <p>A review of contextual factors provided contextual information relevant to fiscal policies to promote healthy diets, including with regard to feasibility (29).</p> <p><i>Additional considerations</i></p> <p>The NUGAG Subgroup on Policy Actions noted the following.</p> <ul style="list-style-type: none"> Linked to acceptability, feasibility may vary depending on the political context and the design of the subsidy.

Characteristic of policy	Question	Judgement	Rationale
			<ul style="list-style-type: none"> Feasibility may vary depending on the available fiscal space in a country, which may be lower in low-income countries.

Annex 8: Key characteristics of policies evaluated by studies included in the systematic review of effects of fiscal policies to promote healthy diets

The following tables provide the key characteristics of the policies evaluated by studies included in the systematic review of the effects of fiscal policies to promote healthy diets (27)(28). The policy details were sourced from the included studies. Some of the policies and/or their characteristics may no longer be current.

Sugar-sweetened beverage taxes

Jurisdiction	Type of tax	Tiered tax	Tax rate	Taxable products ^a
National taxes				
Barbados	Excise: ad valorem	No	10%	SSBs, including sodas, sugar-sweetened juices, and sugar-sweetened sports and energy drinks Exemptions: 100% juices, sugar-free (diet) sodas and sugar-free flavoured waters
Chile	Excise: ad valorem	Yes	≤6.25 g sugar/L: 10% >6.25 g sugar/L: 18%	SSBs, including sodas; industrialized juice drinks; powdered and concentrated beverages with added sugar; and beverages containing artificial sweeteners, flavours or dyes Exemptions: plain milk, flavoured sweetened milk-based drinks, 100% fruit juices and unflavoured water
Denmark	Excise: specific (volumetric)	Yes	January 1998: 1.00 kr/L January 2001: 1.65 kr/L October 2003: 1.15 kr/L January 2012: ≤0.5 g added sugar/100 mL: 0.57 kr/L >0.5 g added sugar/100 mL: 1.58 kr/L July 2013: ≤0.5 g added sugar/100 mL: 0.30 kr/L >0.5 g added sugar/100 mL: 0.82 kr/L January 2014: Tax removed	Soft drinks
Finland	Excise: specific (volumetric)	Yes	2011: €0.075/L 2012: €0.11/L 2014: Sugar-sweetened beverages and juices: €0.220/L	Soft drinks, including sugar-sweetened and non-sugar-sweetened soft drinks, juices and waters

Jurisdiction	Type of tax	Tiered tax	Tax rate	Taxable products ^a
			Sweetener-based soft drinks and waters: €0.11/L	
France	Excise: specific (volumetric)	No	2012: €7.16/100 L 2013: €7.31/100 L 2014: €7.45/100 L	All non-alcoholic beverages containing added sugar (e.g. sodas, fruit juice) or sweeteners (e.g. diet drinks)
Hungary	Excise: specific (volumetric)	No	7 ft/L	Soft drinks with added sugar >8 g/100 mL Exemptions: drinks with >25% fruit or vegetable content, and products prepared with the use of ≥50% milk
			200 ft/L	Syrups or concentrates for soft drinks Exemptions: syrups with >25% fruit or vegetable content
Mexico	Excise: specific (volumetric)	No	1 peso/L	Sugary drinks, including sodas, some nectars, concentrates with added sugar and powdered drink mixes Exemptions: alcoholic beverages, dairy products, drinks sweetened with non-caloric sugar substitutes
Portugal	Excise: specific (volumetric)	Yes	≥80 g sugar/L: €16.69/100 L <80 g sugar/L: €8.22/100 L	Non-alcoholic drinks with added sugar or sweeteners, including liquid or powder concentrates Exemptions: milk-, soy- or rice-based drinks; fruit-, algae- or veggie-based juice and nectar; cereal- and nut-based drinks; and drinks considered essential for special dietary needs
Saudi Arabia	Excise: ad valorem	No	50%	Carbonated beverages, including diet drinks and flavoured sparkling water Exemptions: many fruit drinks
			100%	Energy drinks
South Africa	Excise: specific (sugar content)	Yes	0.021 R/g sugar/100 mL over a threshold of 4 g/100 mL	Carbonates (sugar sweetened and artificially sweetened), concentrates, fruit nectars, sports and energy drinks, and ready-to-drink teas Exemptions: non-flavoured bottled waters and 100% fruit juices
United Kingdom	Excise: specific (volumetric)	Yes	>8 g sugar/100 mL: £0.24/L 5–8 g sugar/100 mL: £0.18/L	Drinks that contain added sugar and have total sugar levels of 5 g per 100 mL and over Exemptions: soft drinks that are 100% fruit juice, are at least 75% milk (or a milk replacement), contain greater than 1.2% alcohol (or are an alcoholic beverage replacement), or are produced or distributed by manufacturers and importers with United Kingdom sales of less than 1 million litres per year
Subnational taxes				

Jurisdiction	Type of tax	Tiered tax	Tax rate	Taxable products^a
Sheffield, United Kingdom	Excise: specific (per unit)	No	£0.20/drink	All drinks containing 5 mg of sugar/100 mL or more
Restaurant chain, United Kingdom	Excise: specific (per unit)	No	£0.10/drink	Non-alcoholic SSBs Exemptions: juices, bottled waters, diet cola and fruit spritzers (fruit juice mixed with water)
Catalonia, Spain	Excise: specific (volumetric)	Yes	>8 g sugar/100mL: 0.12 €/L 5–8 g sugar/100 mL: 0.08 €/L	Beverages that include caloric sweeteners such as sugar, honey, fructose, sucrose, syrups or nectar (corn, maple, agave and rice) Exemptions: beverages made from natural, concentrated or reconstructed fruit or vegetable juices; milks or milk derivatives that do not contain additional caloric sweeteners; yeast yoghurts; drinkable fermented milk; medical products; and alcoholic beverages
State sales taxes, USA	Sales	No	Varies	Varies
Berkeley, USA	Excise: specific (volumetric)	No	\$0.01/oz	Beverages with added sugar (equivalent to ≥ 2 kcal/oz) Exemptions: milks, beverages for medical use, alcoholic beverages, 100% fruit juices, water, and diet beverages without added sugar
Boulder, USA	Excise: specific (volumetric)	No	\$0.02/oz	SSBs with at least 5 g of caloric sweetener per 12 fluid ounces Exemptions: diet soda, products in which milk is the primary ingredient, alcoholic mixers and coffee drinks
Cook County, Illinois, USA	Excise: specific (volumetric)	No	\$0.01/oz	SSBs and artificially sweetened beverages
Maine, USA	Sales	No	5.50%	Soft drinks, including carbonated water
Oakland, USA	Excise: specific (volumetric)	No	\$0.01/oz	SSBs (e.g. soda; sports, energy and fruit-flavoured drinks; sweetened coffee and tea) containing ≥ 25 kcal/12 oz Exemptions: milk products, infant or baby formula, beverages for medical use, 100% juice, and beverages sweetened only with artificial sweeteners (e.g. diet soda)
Ohio, USA	Sales	No	5%	Any sweetened non-alcoholic beverage, whether sweetened naturally or artificially (unless it contains milk products or a milk substitute, or >50% fruit or vegetable juice by volume)
Philadelphia, USA	Excise: specific (volumetric)	No	\$0.015/oz	Any sweetened beverage, including those that contain artificial sweeteners (e.g. diet sodas)

Jurisdiction	Type of tax	Tiered tax	Tax rate	Taxable products ^a
San Francisco, USA	Excise: specific (volumetric)	No	\$0.01/oz	SSBs (e.g. soda; sports, energy and fruit-flavoured drinks; sweetened coffee and tea) containing ≥25 kcal/12 oz Exemptions: milk products, infant or baby formula, beverages for medical use, 100% juice, and beverages sweetened only with artificial sweeteners (e.g. diet soda)
Seattle, USA	Excise: specific (volumetric)	No	\$0.0175/oz	SSBs with at least 40 kcal/12 fluid oz
Washington, USA	Sales	No	1/6 c/oz	Carbonated beverages, including diet and regular versions

^a Large variations are seen in the included beverages. None of the evaluated taxes included 100% fruit juices.

Food taxes

Jurisdiction	Type of tax	Tiered tax	Tax rate	Taxable products ^a
National taxes				
Denmark	Excise: specific (weight based)	No	16 kr/kg saturated fatty acids	Meat, dairy products, animal fats and vegetable oils that contain >2.3 g saturated fatty acids/100 g
			6.61 kr/L	Ice-cream or ice-cream mix that contains >0.5 g sugar/100 mL
			5.29 kr/L	Ice-cream or ice-cream mix that contains <0.5 g sugar/100 mL
			24.61 kr/kg	Chocolate and chocolate products; liquorice products; marzipan; sweets; effervescent products; chewing gum; and cakes with a certain sugar, cacao or chocolate content
			20.93 kr/kg	Chocolate and chocolate products, liquorice products, marzipan, sweets, effervescent products, chewing gum, and cakes that contain <5 g sugar/kg
Finland	Excise: specific (weight based)	No	2011: €0.75/kg 2012: €0.95/kg	Sweets, including confectionery, chocolate and ice-cream
Hungary	Excise: specific (weight based)	No	2011: 100 ft/kg 2012: 130 ft/kg	Pre-packed sweets without cocoa that contain >25 g sugar/100 g; pre-packed sweets with cocoa that contain >40 g sugar/100 g and <40 g cocoa/100 g
			2011: 100 ft/kg 2012: 70 ft/kg	Sugared cocoa powder that contains >40 g sugar/100 g and <40 g cocoa/100 g
			2011: 200 ft/kg 2012: 250 ft/kg	Salty snacks that contain >1 g salt/100 g; condiments and instant soup that contain >5 g salt/100 g Exemptions: bakery products that contain <2 g salt/100 g (since 2012), ketchup, mustard, ready-to-eat soup and infant formula
			2011: 0 ft/kg 2012: 500 ft/kg	Jams that contain >35 g sugar/100 g
Mexico	Excise: ad valorem	No	8%	Products with a caloric content ≥275 kcal/100 g, including snacks, candies, chocolate, pudding, marmalade, peanut butter and cereals Exemptions: products considered part of the “canasta basica” (basic consumption basket), including oil, milk and bread
Subnational taxes				
Colorado, USA	Sales	No	2.90%	Candy (defined as “a preparation of sugar, honey, or other natural or artificial sweeteners in combination with chocolate, fruit, nuts, or other ingredients or flavorings in the form of bars, drops, or pieces. ‘Candy’ shall not include any preparation containing

Jurisdiction	Type of tax	Tiered tax	Tax rate	Taxable products ^a
				flour and shall require no refrigeration")
Maine, USA	Sales	No	5.50%	Snack foods such as crackers, bread sticks, ice-cream, frozen yoghurt, muffins, pies, cookies, cakes, gelatin, puddings, hot cocoa mix, marshmallows, breakfast bars and roasted nuts
State sales taxes, USA	Sales	No	Varies	Varies

^a Large variations are seen in the included beverages. None of the evaluated taxes included 100% fruit juices.

Food subsidies

Jurisdiction	Type of subsidy	Details of the subsidy
New South Wales, Australia	Food voucher	A fruit and vegetable subsidy programme targeting low-income Aboriginal families with one or more young children organized by three Aboriginal medical services. Families receive a weekly box of subsidized seasonal fruits and vegetables, worth \$40–60 (depending on family size), with a co-payment of \$5.
India	Public distribution system	A public distribution system providing pulses and fortified wheat flour
United Kingdom	Food vouchers	A government voucher scheme targeting low-income pregnant women and low-income households with children aged 3 years or younger. Families receive weekly vouchers to spend on plain fresh fruit and vegetables, and milk.
United States	Food vouchers	Various programmes providing food vouchers and other incentives for low-income households to purchase fruits and vegetables, as part of the Supplemental Nutrition Assistance Program (SNAP)
Latvia	VAT rate reduction	Reduction of the VAT on fruits and vegetables (from the standard rate of 21% to 5%)