



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 774548

EC Framework Programme for Research and Innovation

Horizon 2020

**H2020-SFS-2017-2-RIA-774548-STOP:
Science & Technology in childhood Obesity Policy**



Science and Technology in
childhood Obesity Policy

Supplementary D4.1a

A review of systematic reviews of the impact on children of three population-wide policies

Authors: Tim Lobstein and Margot Neveux, World Obesity Federation, UK,

Version: Final Preparation date: 27/05/21

Dissemination Level

PU	Public	<input checked="" type="checkbox"/>
PP	Restricted to other programme participants (including the Commission Services)	<input type="checkbox"/>
RE	Restricted to a group specified by the consortium (including the Commission Services)	<input type="checkbox"/>
CO	Confidential, only for members of the consortium (including the Commission Services)	<input type="checkbox"/>



Abbreviation	Definition
EC	European Commission
EU	European Union
FOP	Front-of-pack
FOPNL	Front-of-pack nutrition labelling
HFSS	High in fat, salt or sugar
Non-RCT	Non-randomised controlled trial
OECD	Organization for Economic Cooperation and Development
PHE	Public Health England
PHP	Public Health Product
PICO	Population, intervention, comparison and outcome
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RCT	Randomised controlled trial
SES	Socio-economic Status
STOP	Science & Technology in childhood Obesity Policy (H2020 project)
WHO	World Health Organization
WHO EURO	World Health Organization Regional Office for Europe
WP4	Work Package 4 of the STOP project



Table of contents

1	D4.1a Executive summary	6
2	Background	8
3	Variation of the task T4.1	8
4	Methods	10
5	Search Protocol	10
6	Data extraction	10
7	Results	11
8	Health-related taxes	15
9	Front-of-pack nutrition labelling	20
10	Marketing to children	23
11	Discussion	30
12	Summary of findings	30
13	Research implications	30
14	Quality assessment	31
15	Limitations	31
16	Conclusion	32
17	References	33
18	Annex	36
	Search strategies	36
	Table of included studies	39
19	Summary of Deliverable 4.1	42
	Deliverable 4.1 Discussion	42
	Cost and cost-effectiveness	42
	Equity and social disparities	42
	Stakeholder acceptability	43
	Deliverable 4.1 Conclusion	43
20	D4.1b Executive summary	45
21	Background	47



22	Variation of the task T4.1	48
23	Methods	49
24	Search Protocol	50
25	Results	51
26	Health-related taxes	54
27	Front-of-pack nutrition labelling	56
28	Marketing to children	56
29	Evidence gaps	63
30	Discussion	66
31	Limitations	66
32	Data collected but not reported	69
33	Conclusion	71
34	References	72
35	Annex	75
	Search strategies	75
	Table of included studies	79
36	Summary of Deliverable 4.1	81
	Deliverable 4.1 Discussion	81
	Cost and cost-effectiveness	81
	Equity and social disparities	81
	Stakeholder acceptability	82
	Deliverable 4.1 Conclusion	82
37	D4.1 (originally submitted M12) Background	83
	Variation of the task T4.1	83
38	Methods	85
39	Results	88
40	Fiscal interventions	93
	Costs, resources and revenues	93
	Equity and human rights	94
	Acceptability for stakeholders	98
41	Front-of-pack nutrition labelling interventions	101
	Costs and resources	101



Equity and human rights.....	101
Acceptability for stakeholders.....	104
42 Interventions to restrict children’s exposure to the marketing of unhealthy foods and beverages.....	107
Costs and resources	107
Equity and human rights.....	108
Acceptability for stakeholders.....	110
43 Discussion.....	113
44 Conclusion	115
45 References	116
46 Annex.....	126
Search strategy	126
Table of included studies in the systematic review	129



1 D4.1a Executive summary

In the EU-funded STOP project three policy interventions are identified for detailed research in WP4: (i) health-related taxes on foods or beverages; (ii) front-of-pack nutrition labelling; (iii) restricting children’s exposure to food and beverage advertising.

Task 4.1 of the STOP project states: *‘The work of WP4 will start with a systematic review and synthesis of the evidence available from studies that have assessed the effectiveness of policy options falling within the domain of this work package. In areas in which systematic reviews have been undertaken previously, STOP will update these reviews and compile “reviews of reviews”, as appropriate.*

After commencement of the STOP project, one of the partners, the World Health Organization (WHO), stated they were funding a global evidence review of policies to address childhood obesity, including the three policy areas identified for WP4. To avoid duplicating work in progress, the STOP project consulted with the WHO and proceeded to produce a narrative review of three key contextual issues not being covered in the WHO reviews: namely the contextual issues of equity, acceptability and costs of the three policy areas. This was submitted in the first reporting period in 2019 as Deliverable 4.1, and subsequently published in a peer-reviewed journal in 2020 (1). A summary of Deliverable 4.1 is given in Annex 8.3 at the end of the present document.

At the first review, the reviewers made the following request:

<i>Deliverable D4.1:</i>	<i>The results of the WHO reports should be reported here at least briefly, otherwise the deliverable is rather pointless.</i> <i>Tables of included studies need to be added, and information of overlap and gaps of included studies with the WHO reviews is missing. The WHO included studies should be checked for relevance for inclusion in the STOP reviews.</i> <i>An updated version should be provided at the end of the next reporting period.</i>
--------------------------	---

(Source: General Project Review Consolidated Report)

The WHO reviews remain in preparation (as of May 2021). In order to support the work of Work Package 4, and in the absence of the WHO reviews, the STOP project has undertaken two further systematic. The first, **Supplementary Deliverable 4.1a**, is a ‘review of reviews’ of the three policy measures, as specified in Task 4.1 and with a specific focus on how the policies might affect children. The second, **Supplementary Deliverable 4.1b**, is a systematic review of published primary research studies, asking whether the three policy measures may serve to reduce or increase the disparities in children’s obesity risk between higher and lower socio-economic groups.

The results of these two additional reviews are designed to support the work undertaken in Task 4.2 which aims to compare the effects of fiscal policies on children overall diet, weight loss, and health with specific attention paid to socio-economically disadvantaged children. The results will also support Task 4.3 which concerns the sensitivity of shoppers for children’s food products to labelling and pricing, across



socio-economically differentiated households, and Task 4.4, which is undertaking modelling work on these same issues.

The present document is the review of reviews, submitted as **Supplementary Deliverable 4.1a**, examining each of the three policy areas. Four major databases of research papers were examined using a set of search words specified in the Annex.

Results: Searches for reviews of health-related taxes provided 76 titles, for front-of-pack labelling 115 titles, and for promotional marketing 142 titles. After removal of duplicates and papers that did not describe evidence consistent with the inclusion criteria a total of 11 reviews of health-related taxes, 6 reviews of front-of-pack labelling and 18 reviews of marketing were accepted for data extraction. Summaries of the findings and their implications for research in the STOP project were then tabulated, and an assessment of the quality of each review undertaken based on the AMSTAR-2 criteria.

The systematic reviews were consistent in their findings: (i) there is evidence for health-related taxes having a beneficial effect on purchases, consumption and health outcomes including bodyweight; (ii) there is evidence for front-of-pack nutrition labelling having a beneficial effect on purchasing and consumption, especially if the format is easily understood, and (iii) there is evidence that the commercial promotion of unhealthy foods through various media have an effect on preferences, purchases, consumption and health outcomes.

Research is needed to better understand the dynamics of the effects described, especially among different children's age-groups. For example, research in health-related taxes should consider variations in price elasticities among sub-population groups are not well documented, and the foods and beverages substituted for the taxed products need further investigation. For labelling, the formats and positioning of labels which would have greatest impact on children need to be elaborated. For marketing, a range of variables need further investigation, including the effects of repetition, the media platforms through which messages are delivered, the long-term effects of advertising (for example, setting brand preferences in earlier childhood that continue into later childhood).

Quality assessment indicated that most reviews, especially more recent ones, undertook evaluations of the quality of the studies they included, reporting on databases and search strategies and risks of bias.

Limitations of the review are discussed, including the likelihood that reviews will have overlapping studies included, and that the consistency in findings of reviews may reflect the common pool of studies on which the reviews are based. Furthermore, the large majority of studies report cross-sectional associations or short-term effects, indicating a need for longitudinal cohort studies.

Conclusion: The present review found that health-related taxation, front-of-pack nutrition labelling and restrictions on children's exposure to the advertising of unhealthy foods and beverages should in principle assist in reducing obesity risk for children. The evidence for all three policies is consistent and in one direction only. Additional research can help to strengthen policy-making.



2 Background

Over 40 million children between the ages of 5-19 years old were affected by overweight or obesity across Europe (WHO region) in 2016, representing a 12% increase since 2010 (2). In a few countries as many as 40% of older children are affected (3).

Obesity prevention policies have been debated in most European member states as well as in leading intergovernmental institutions, including the Council of Europe, the WHO, and the UN General Assembly, with increasing interest in population-wide interventions including fiscal measures (4), front-of-pack nutrition labelling (5), and marketing restrictions (6). These policy areas are the focus of the present report.

In the EU-funded STOP project these policy interventions are identified for detailed research in Work package 4 (WP4). These are:

- fiscal policies (i.e. health-related taxes or levies imposed on food and non-alcoholic beverages);
- regulation of food labelling (particularly the provision of front-of-pack nutrition information);
- regulation of the marketing of food products to children (including the extent of exposure and the power of advertising, and the media platforms used).

WP4 includes as its first task a review of the available evidence concerning these policies. Task 4.1 of the STOP project states:

The work of WP4 will start with a systematic review and synthesis of the evidence available from studies that have assessed the effectiveness of policy options falling within the domain of this work package. [...] The focus of the systematic review in WP4 will be threefold, including fiscal policies (food and non-alcoholic beverages); regulation of food labelling; and regulation of the marketing of food products to children. In areas in which systematic reviews have been undertaken previously, STOP will update these reviews and compile “reviews of reviews”, as appropriate.

3 Variation of the task T4.1

After the award of the STOP project grant it was learnt that the WHO intended to commission a number of systematic reviews of health-related policy interventions as part of their guideline development process, and their commissions included systematic reviews of the three policies described above for WP4, namely fiscal policies, nutrition labelling policies and policies to restrict marketing to children. The reviews were being undertaken in the latter half of 2018 and the year of 2019, and due to be presented to the WHO’s expert advisory group meeting in December 2019.

In consultation with the WHO it was considered that a better use of the STOP effort would be to supplement the systematic reviews commissioned by the WHO with a set of contextual reviews. These were undertaken in respect of three cross-cutting areas of concern in relation to the three policy areas: costs, acceptability, and equity. The results were submitted as Deliverable D4.1 in July 2019. The results were also published in a peer reviewed journal in mid-2020 (1).

At its first review of the STOP project, the European Commission requested a supplement to Deliverable 4.1 which would include a summary of the WHO systematic reviews. Unfortunately, by May 2021 the WHO reviews had not been published, and the supplementary work requested by the Commission would not be possible during the



Funded by the Horizon 2020
Framework Programme
of the European Union
GA: 774548



second review period. In order to provide additional support to Work Package 4, the STOP project has undertaken a 'review of reviews' consistent with, and in support of, WP4 Task 4.1, and submitted as Deliverable 4.1a, the present document.

The primary objective of the present review is to support STOP Work Package 4 and its research into effective policy-making, and specifically to examine the evidence available on how policies in the three areas outlined above have an impact on children.



4 Methods

The present review systematically investigates the peer-reviewed systematic reviews in relation to three types of policy intervention: fiscal policies (e.g. health-related food and beverage taxes); front-of-pack (or menu display) nutrition labelling; and restrictions to limit children's exposure to the promotional marketing of foods and beverages. The search for evidence is focused on reviews that consider the effects of policies in these three areas on children or households with children.

In order to clarify the task of the present review, the following criteria were applied:

- (i) include systematic reviews in each of the three policy areas; and
- (ii) (for front-of-pack labelling studies) include only systematic reviews of front-of-pack labelling (excludes menu labelling and on-shelf signage); and
- (iii) (for marketing to children) include only systematic reviews of mass-media promotion of food and beverages (excludes shop displays, local advertising); and
- (iv) include systematic reviews that accept studies with modelling evidence; and
- (v) include only systematic reviews that have studies with children as subjects (as individuals or as households identified as including children). 'Children' is persons under age 18 years or as defined by the review's authors.

5 Search Protocol

Searches were undertaken March 20 through May 15, 2021. No limits were set on the date of publication. No language limits were set.

Databases searched were (i) OVID/Medline, (ii) SCOPUS, (iii) Web of Science Core Collection (includes six citation indexes), and (iv) Cochrane Library. References in the included papers were also examined for additional reviews that might be eligible for inclusion.

Search terms used for each database are shown in Annex 8.1. Effectively they included;

- (i) (food OR beverages) AND (child+) AND (fiscal OR [taxation terms]) AND (systematic review)
- (ii) (food OR beverages) AND (child+) AND (nutrition label+) AND (systematic review)
- (iii) (food OR beverages) AND (child+) AND (advertising OR [marketing terms]) AND (systematic review)

Papers were examined by title, abstract and in full, to determine whether they met the inclusion criteria specified in the PICO table above. In the papers that were examined in full the references cited were also examined for additional papers that potentially met the inclusion criteria.

6 Data extraction

Full text papers were examined for their statements on the effectiveness of policies and how these may impact on children. Relevant statements were transcribed from the authors' text and tabulated. Quality assessment was undertaken for all papers based on



the set of AMSTAR-2 criteria (7) recommended for systematic reviews. The results were tabulated and discussed by both authors with disagreements settled by discussion.

7 Results

The search of the four databases gave the results shown in the Prisma charts below.

Searches for health-related taxes provided 76 titles, for front-of-pack labelling 115 titles, and for promotional marketing 142 titles. After removal of duplicates, the titles and abstracts were inspected and were excluded if they did not describe evidence consistent with the inclusion criteria specified above.

A total of 50 records were identified from the databases for full examination. One additional paper was added for full examination based on references cited in the included reviews, bringing the total to 51 papers for full examination:

- Health-related taxes: n = 16
- Front-of-pack nutrition labelling: n = 10
- Interventions to restrict marketing to children: n = 23

After examination of the full texts, the following number of papers were included for data extraction:

- Health-related taxes: n = 11
- Front-of-pack nutrition labelling: n = 6
- Interventions to restrict marketing to children: n = 18

Fig 4.1. PRISMA chart for systematic reviews: health-related taxes

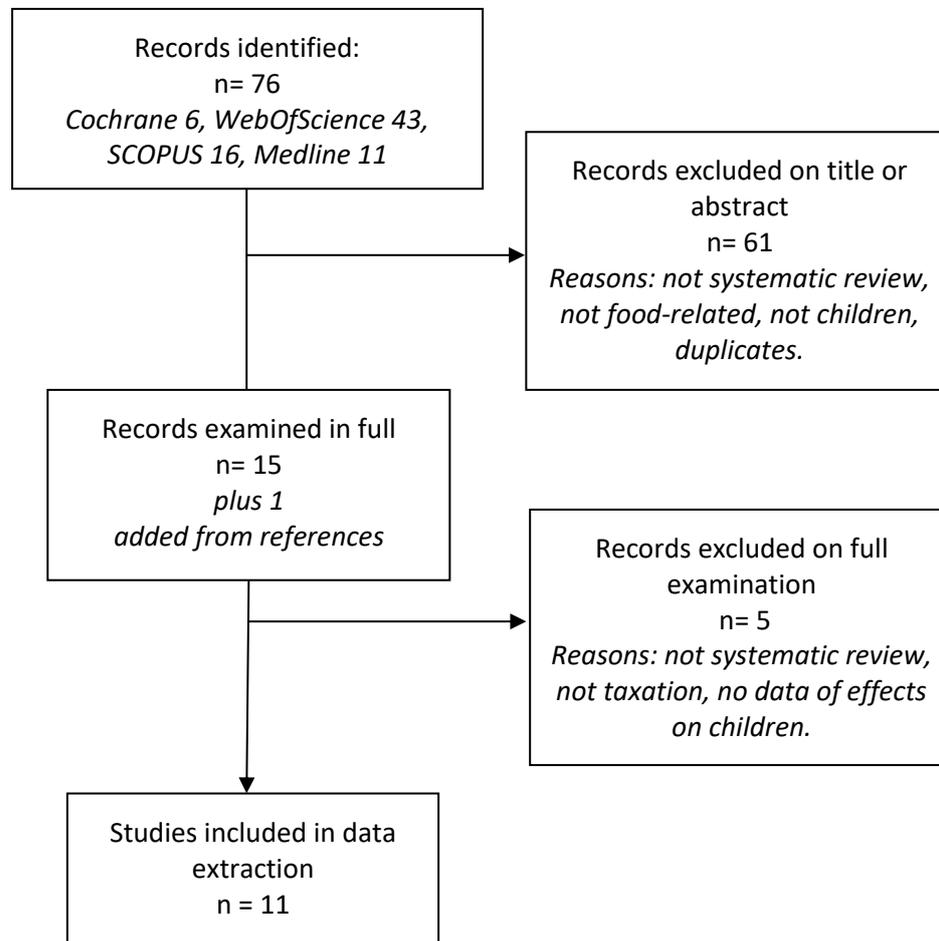


Fig 4.2. PRISMA chart for systematic reviews: front-of-pack nutrition labelling

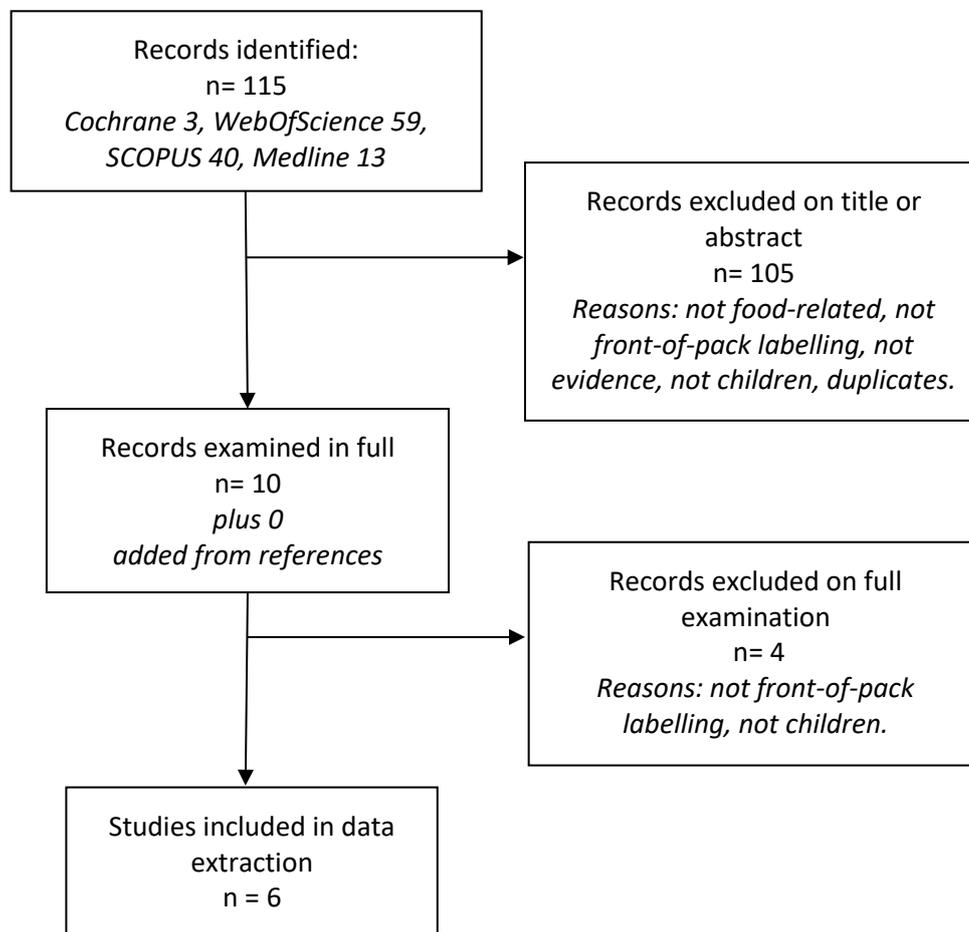
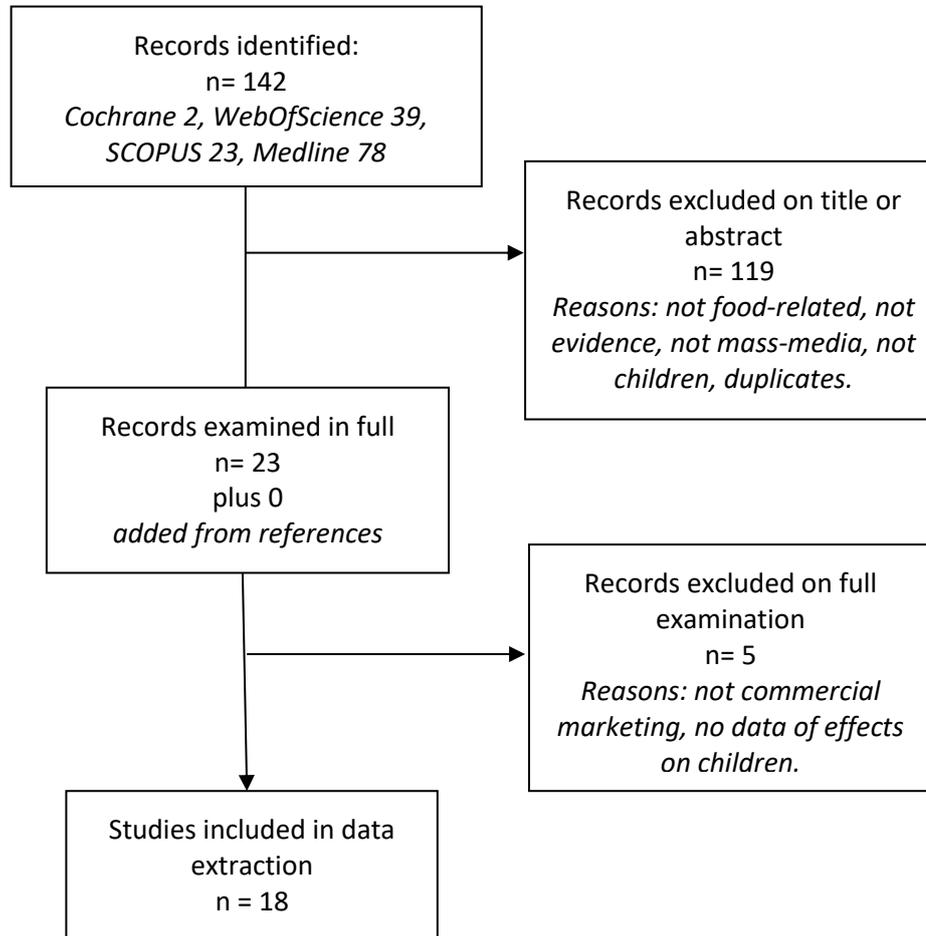


Fig 4.3. PRISMA chart for systematic reviews: marketing to children





8 Health-related taxes

Eleven reviews met the inclusion criteria, and the relevant findings extracted from each review are shown in Table 4.1. Reviews are listed in chronological order. The Table also shows whether the primary studies examined in each review included European evidence. The Table also includes a brief comment on the implications of each review’s main finding for research, such as that being undertaken in the STOP project.

Table 4.2 makes an assessment of the quality of each review based on AMSTAR-2 criteria.

Table 4.1. Systematic reviews meeting the inclusion criteria: health-related taxes

Author, year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
Powell and Chaloupka, 2009 (8)	Food Prices and Obesity: Evidence and Policy Implications for Taxes and Subsidies.	No – USA only	‘... evidence suggests that small taxes or subsidies are not likely to produce significant changes in BMI or obesity prevalence but that nontrivial pricing interventions may have some measurable effects on Americans’ weight outcomes, particularly for children and adolescents, low-SES populations, and those most at risk for overweight.’ (p229-230)	Taxes can improve weight outcomes	Consider the impact of taxes at a range of levels.
Moise et al, 2011 (9)	Limiting the consumption of sugar sweetened beverages in Mexico's obesogenic environment: a qualitative policy review and stakeholder analysis	Yes – but focus on Mexico	‘We conducted a systematic review of international and national legal instruments concerned with SSB consumption. ... Public policy should target marketing practices and taxation. The school environment remains a promising target for policy. Access to safe drinking water must complement comprehensive and multi-sector policy approaches to reduce access to SSB.’ (p458)	Taxes can reduce SSB consumption	Price elasticities need to be confirmed (e.g. for children). Consider taxes alone versus a multi-policy approach.
Powell et al, 2013 (10)	Assessing the potential effectiveness of food and beverage taxes and subsidies for improving public health: a systematic review of prices,	No – USA only	‘Based on the recent literature, the price elasticity of demand for SSBs, fast food, fruits and vegetables was estimated to be -1.21, -0.52, -0.49 and -0.48, respectively. The studies that linked soda taxes to weight outcomes showed minimal impacts on weight;	Taxes can improve weight outcomes. Higher taxes likely to have greater effect on	Consider the impact of taxes by (a) level of tax, and (b) current consumption level. Consider separate and in



Author, year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
	demand and body weight outcomes		however, they were based on existing state-level sales taxes that were relatively low. Higher fast-food prices were associated with lower weight outcomes particularly among adolescents, suggesting that raising prices would potentially impact weight outcomes. Lower fruit and vegetable prices were generally found to be associated with lower body weight outcomes among both low-income children and adults, suggesting that subsidies that would reduce the cost of fruits and vegetables for low socioeconomic populations may be effective in reducing obesity. Pricing instruments should continue to be considered and evaluated as potential policy instruments to address public health risks.' (p110)	lower socio-economic families.	combination with subsidies on healthier food.
Cabrera-Escobar et al 2013 (11)	Evidence that a tax on sugar sweetened beverages reduces the obesity rate: a meta-analysis	Yes	An increase in price of SSBs is associated with a decrease in consumption; and the higher the price increase, the greater the reduction in consumption. Also, as the price of SSBs rises, the consumption of fruit juices and whole milk tends to increase and the consumption of diet drinks decreases. (p6) [Modelling study.]	Price elasticities indicate taxes can improve weight outcomes.	Consider elasticities in different population groups.
Alagiyawanna et al 2015 (12)	Studying the consumption and health outcomes of fiscal interventions (taxes and subsidies) on food and beverages in countries of different income classifications; a systematic review.	Yes	Evidence suggests that fiscal interventions on foods can influence consumption of taxed and subsidized foods and consequently have the potential to improve health. There is a lack of evidence available from middle and low income countries on such interventions... research conducted in middle and low income countries will be beneficial in advocating policy makers on the effectiveness of FIs in countering the growing issues of non-communicable diseases in these countries. (p1)	Taxes can improve health outcomes.	Consider responses to taxes in different population groups.



Funded by the Horizon 2020
Framework Programme
of the European Union
GA: 774548



Author, year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
Olstad et al 2016 (13)	Can policy ameliorate socioeconomic inequities in obesity and obesity-related behaviours? A systematic review of the impact of universal policies on adults and children.	Yes	'Fiscal measures had consistently neutral or positive impacts on inequities.' (p1214)	Taxes can reduce disparities in obesity rates.	Consider taxes versus subsidies (e.g. applied to school meals) on population groups.
Wright et al 2017 (14)	Policy lessons from health taxes: a systematic review of empirical studies	Yes	'If the primary policy goal of a health tax is to reduce consumption of unhealthy products, then evidence supports the implementation of taxes that increase the price of products by 20% or more. However, where taxes are effective in changing health behaviours, the predictability of the revenue stream is reduced.' (p1)	Taxes at 20% can improve health outcomes.	Consider response to taxes at different levels, within population groups.
Roberts et al 2017 (15)	A rapid review examining purchasing changes resulting from fiscal measures targeted at high sugar foods and sugar-sweetened drinks	Yes	'The evidence reviewed focused on consumer behaviour outcomes and suggested that fiscal strategies can influence purchases of high sugar products. Although the majority of studies (n = 10), including three field studies, demonstrated that an increase in the price of high sugar foods and SSDs resulted in a decrease in purchases, eight studies were conducted in a laboratory or virtual setting which may not reflect real-life situations. Findings from this review support evidence from the broader literature that suggests that fiscal measures can be effective in influencing the purchasing of high sugar foods and SSDs.' (p1)	Prices affect purchases of sugared products. Children (12-14y) are similar to adults	Consider age group and socio-economic position in response to price manipulation.
Afshin et al 2017 (16)	The prospective impact of food pricing on improving dietary consumption: A systematic review and meta-analysis	Yes	In pooled analyses, a 10% decrease in price (i.e. subsidy) increased consumption of healthful foods by 12% whereas a 10% increase price (i.e. tax) decreased consumption of unhealthful foods by 6%. By food group, subsidies increased intake of fruits and vegetables by 14% and other healthful foods by 16% without significant effects on more healthful	Taxes and subsidies can improve consumption.	Consider comparing subsidies versus taxes on health outcome.



Funded by the Horizon 2020
Framework Programme
of the European Union
GA: 774548



Author, year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
			beverages. Each 10% price increase reduced sugar-sweetened beverage intake by 7%, fast foods, by 3% and other unhealthful foods by 9%. Changes in price of fruits and vegetables reduced body mass index [while] price changes for sugar-sweetened beverages or fast foods did not significantly alter body mass index, based on 4 studies. (p1-2)		
Teng et al 2019 (17)	Impact of sugar-sweetened beverage taxes on purchases and dietary intake: Systematic review and meta-analysis	Yes	The equivalent of a 10% SSB tax was associated with an average decline in beverage purchases and dietary intake of 10.0% ... [and] was also associated with a nonsignificant 1.9% increase in total untaxed beverage consumption (eg, water). Based on real-world evaluations, SSB taxes introduced in jurisdictions around the world appear to have been effective in reducing SSB purchases and dietary intake. (p1187)	Taxes can change consumption. 'No evidence that results varied by age group.'	Consider different population groups.
Lobstein et al 2020 (1)	Costs, equity and acceptability of three policies to prevent obesity: A narrative review to support policy development	Yes	Beverage taxes were found likely to be highly cost-effective, moderately favourable for health equity, supported by the public (depending on the use of revenues) and by health professionals and civil society groups and opposed by commercial interests. (p562)	Taxes likely to reduce health inequity, be cost-effective and publicly acceptable.	Consider different population groups, and messages about the use of the taxes levied.

Table 4.2. Assessment for systematic reviews: health-related taxes

Author year (reference)	PICO table / inclusion criteria (IC) list	Pre-registration	Databases searched	Multi-person selection and extraction	List of excluded studies and reasons	GRADE or similar ratings	Risk of bias assessments	Assessed sources of funding	Authors' funding and COI statements
Powell and Chaloupka 2009 (8)	IC list	No	4	Yes	No	No	No	No	Funding



Author year (reference)	PICO table / inclusion criteria (IC) list	Pre-registration	Databases searched	Multi-person selection and extraction	List of excluded studies and reasons	GRADE or similar ratings	Risk of bias assessments	Assessed sources of funding	Authors' funding and COI statements
Moise et al 2011 (9)	IC list	No	5	Coding	No	No	No	No	Funding
Powell et al 2013 (10)	IC list	No	4	Extraction	No	No	No	No	Funding, COI
Cabrera-Escobar et al 2013 (11)	IC list	No	6	No	No	No	Yes	No	Funding, COI
Alagiyawanna et al 2015 (12)	IC list	No	4	Extraction	No	Yes	Yes	No	Funding, COI
Olstad et al 2016 (13)	IC list	Yes	3	Yes	No	Yes	Yes	No	Funding, COI
Wright et al 2017 (14)	IC list	No	6	Yes	No	No	No	No	Funding, COI
Roberts et al 2017 (15)	IC list	No	8	Final review	No	Yes	Yes	No	Funding, COI
Afshin et al 2017 (16)	IC list	Yes	7	Extraction	No	Yes	Yes	No	Funding, COI
Teng et al 2019 (17)	IC list	Yes	4	Yes	No	Yes	Yes	Yes	Funding, COI
Lobstein et al 2020 (1)	PICO table	No	3	Yes	No	No	No	No	Funding, COI

For a discussion of these results please go to Section 5: Discussion.



9 Front-of-pack nutrition labelling

Six reviews met the inclusion criteria, and the relevant findings extracted from each review are shown in Table 4.3. Reviews are listed in chronological order. The Table also shows whether the primary studies examined in each review included European evidence. The Table also includes a brief comment on the implications of each review’s main finding for research, such as that being undertaken in the STOP project.

Table 4.4 makes an assessment of the quality of each review based on AMSTAR-2 criteria.

Table 4.3. Systematic reviews meeting the inclusion criteria: Front-of-pack labelling

Author year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
Campos et al 2011 (18)	Nutrition labels on pre-packaged foods: a systematic review	Yes	‘...label use is notably lower among children, adolescents and older adults... Individuals with lower socio-economic status are also less likely to use nutrition labels...’ Labelling with interpretative symbols “found to increase consumer ability to identify healthier food options and consumer attention in general.’ (p1502) (Review undertaken prior to the stronger warnings used in Latin America.)	FOP signalling can assist consumer choice, especially for health-concerned adults.	Consider the impact of different designs of FOP signalling.
Hersey et al 2013 (19)	Effects of front-of-package and shelf nutrition labeling systems on consumers	Yes	‘some groups of consumers are less likely to use FOP labels than other groups. Groups less likely to use FOP labels include less nutrition-conscious individuals, those of low socioeconomic status, those with higher body mass indices, and those who have children living in their households. Health-conscious consumers and consumers who have family members on special diets are more likely to purchase foods indicated as “healthy” by FOP and shelf-labeling systems than price-focused consumers. (p11)	FOP signalling can assist choice for nutritious-conscious individuals.	Consider the impact of different designs of FOP signalling, and what information campaigns may be needed.



Author year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
			...the percentage of consumers who use these [FOP labelling] schemes may be influenced by the level of education efforts and/or the particular communication strategy. To improve the nation's health, education and communication efforts for FOP and shelf nutrition labeling systems should target consumers who are at high risk for developing obesity-related illnesses and who are less likely to use FOP and shelf nutrition labeling schemes, including consumers with low socioeconomic status, with high body mass indices, or with children living in their households' (p12)		
Grummon and Hall 2020 (20)	Sugary drink warnings: A meta-analysis of experimental studies	Yes	'... warnings exerted similar effects on intentions among studies that did and did not include children. '... sugary drink warnings exerted beneficial effects on real-stakes behavioral endpoints, including sugary drink purchases, calories purchased from beverages, and amount of sugar purchased from beverages. Sugary drink warnings also led to beneficial effects on noticing, emotions, thinking about health effects, several attitudes and beliefs, and behavioral intentions.' (p13)	For sugar-sweetened beverages, clear warnings are effective across population groups	Consider the impact of different designs of FOP signalling.
Hallez et al 2020 (21)	That's My Cue to Eat: A Systematic Review of the Persuasiveness of Front-of-Pack Cues on Food Packages for Children vs. Adults	Yes	'The results suggest that children and adults are susceptible to packaging cues, with most evidence supporting the impact of visual cues. More specifically, children more often choose products with a licensed endorser and eat more from packages portraying the product with an exaggerated portion size.' (p1)	Positive visual signals can attract children, but warning labels are less effective.	Consider the impact of different designs of FOP signalling.
Von Philipsborn et al 2020 (22)	Environmental interventions to reduce the consumption of sugar-sweetened beverages and their effects on health	Yes	'We found moderate-certainty evidence that traffic-light labelling is associated with decreasing sales of SSBs, and low-certainty evidence that nutritional rating score labelling is associated with decreasing sales of SSBs.' (p2)	Data are for adults and children combined, and indicate signalling can reduce sales of sugar-sweetened beverages.	Consider the impact on children of different FOP signal designs.



Author year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
Lobstein et al 2020 (1)	Costs, equity and acceptability of three policies to prevent obesity: A narrative review to support policy development	Yes	Depending on the design, front-of-pack nutritional labelling is likely to be highly cost-effective, moderately favourable for health equity, supported by the public, health professionals and civil society groups, and opposed by commercial interests. (p562)	FOP labelling can reduce health inequity (depending on design), is cost effective and publicly acceptable.	Consider the impact of different designs of FOP signalling.

Table 4.4. Assessment for systematic reviews: front-of-pack labelling

Author year (reference)	PICO table / inclusion criteria (IC) list	Pre-registration	Databases searched	Multi-person selection and extraction	List of excluded studies and reasons	GRADE or similar ratings	Risk of bias assessments	Assessed sources of funding	Authors' funding and COI statements
Campos et al 2011 (18)	IC list	No	4	No	No	No	No	No	Funding, COI
Hersey et al 2013 (19)	No	No	12	Yes	No	Yes	Yes	No	Funding, COI
Grummon and Hall 2020 (20)	PICO table	Yes	7	Yes	No	Yes	Yes	No	Funding, COI
Hallez et al 2020 (21)	IC list	Yes	4	Yes	No	Yes	Yes	No	Funding, COI
Von Philipsborn et al 2020 (22)	IC list	No	14	Yes	Yes	Yes	Yes	Yes	Funding, COI
Lobstein et al 2020 (1)	PICO table	No	3	Yes	No	Not published	Not published	No	Funding, COI

For a discussion of these result please go to Section 5: Discussion.



Funded by the Horizon 2020
Framework Programme
of the European Union
GA: 774548



10 Marketing to children

Eighteen reviews met the inclusion criteria, and the relevant findings extracted from each review are shown in Table 4.5. Reviews are listed in chronological order. The Table also shows whether the primary studies examined in each review included European evidence. The Table also includes a brief comment on the implications of each review’s main finding for research, such as that being undertaken in the STOP project.

Table 4.6 makes an assessment of the quality of each review based on AMSTAR-2 criteria.

Table 4.5. Systematic reviews meeting the inclusion criteria: Marketing to children

Author year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
Carter 2006 (23)	The weighty issue of Australian television food advertising and childhood obesity	Yes – but focus on Australia	‘Energy-dense food advertising is ubiquitous in children’s television programming, but children’s ability to perceive the commercial intent of advertisements only emerges gradually as a function of age. Until such time, children are trusting, and hence vulnerable, to food advertising, influencing their desires and purchase requests to parents. There is robust evidence to suggest that television viewing and childhood obesity are related. However, the direction of causation and specific contribution of food advertising remains equivocal.’ (p1)	Children’s exposure is related to obesity, though causation is not shown.	Consider vulnerability of children in different age groups.
Moise et al 2011 (9)	Limiting the consumption of sugar sweetened beverages in Mexico's obesogenic environment: a qualitative policy review and stakeholder analysis	Yes – but focus on Mexico	‘We conducted a systematic review of international and national legal instruments concerned with SSB consumption. ... Public policy should target marketing practices and taxation. The school environment remains a promising target for policy. Access to safe drinking water must complement comprehensive and multi-sector policy approaches to reduce access to SSB.’ (p458)	Evidence that advertising restrictions are justifiable.	Consider marketing restrictions alone and in combination with complementary policies.



Author year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
Díaz Ramírez et al 2011 (24)	Effect of food television advertising on the preference and food consumption: systematic review	Yes	In pre-school and school-age children the effects of advertising are consistent, with demand for healthier foods increased following healthy food advertisements, and demand for unhealthy foods increased following unhealthy food advertising. These results highlight the importance of establishing rules that regulate the advertising of advertisements low-nutrient foods on TV and those that contain calories, salt intake, fat and sugars, not essential for a diet healthy. Likewise, it is recommended to inform parents about the risk posed by television advertising on selection, consumption and demand food.	Short-term evidence that advertising increases demand.	Consider short-term and long-term effects of advertising on health behaviours.
Galbraith-Emami and Lobstein 2013 (25)	The impact of initiatives to limit the advertising of food and beverage products to children: a systematic review	Yes	‘...we undertook a systematic review to examine the data available on levels of exposure of children to the advertising of less healthy foods since the introduction of the statutory and voluntary codes. The results indicate a sharp division in the evidence, with scientific, peer-reviewed papers showing that high levels of such advertising of less healthy foods continue to be found in several different countries worldwide. In contrast, the evidence provided in industry-sponsored reports indicates a remarkably high adherence to voluntary codes. We conclude that adherence to voluntary codes may not sufficiently reduce the advertising of foods which undermine healthy diets, or reduce children’s exposure to this advertising.’ (p960)	Marketing restrictions are justified but exposure to advertising differs according to the measures used.	Consider different types of exposure measure and impact measure. Consider format of advertising, media platform, hours and times of day.
Chambers et al 2015 (26)	Reducing the volume, exposure and negative impacts of advertising for foods high in fat, sugar and salt to children: A systematic review of the evidence from statutory and self-regulatory	Yes	‘Findings suggested statutory regulation could reduce the volume of and children’s exposure to advertising for foods HFSS, and had potential to impact more widely. Self-regulatory approaches showed varied results in reducing children’s exposure. There was some limited support for educational measures.’ (p32)	Marketing restrictions are justified, but the types of restriction have different effects.	Consider exposure by hours, repetition, type of promotional message, advertising content and format, media platform, and age groups targeted.



Funded by the Horizon 2020
Framework Programme
of the European Union
GA: 774548



Author year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
	actions and educational measures.				
Kelly et al 2015 (27)	A Hierarchy of Unhealthy Food Promotion Effects: Identifying Methodological Approaches and Knowledge Gaps	Yes	‘Evidence supports a logical sequence of effects linking food promotions to individual-level weight outcomes. Future studies should demonstrate the sustained effects of marketing exposure, and exploit variations in exposures to assess differences in outcomes longitudinally.’ (p e86)	For children, the data support a causative sequence from marketing exposure to weight gain.	Long-term effects of advertising exposure remain under-researched.
Kraak and Story 2015 (28)	Influence of food companies’ brand mascots and entertainment companies’ cartoon media characters on children’s diet and health: a systematic review and research needs	Yes	‘Results suggest that cartoon media character branding can positively increase children’s fruit or vegetable intake compared with no character branding. However, familiar media character branding is a more powerful influence on children’s food preferences, choices and intake, especially for energydense and nutrient-poor foods (e.g. cookies, candy or chocolate) compared with fruits or vegetables.’ (p107)	Familiar cartoons can influence children’s food intake, especially for less healthful foods.	Consider the format and type of advertising, use of child-friendly images and messages.
Sonntag et al 2015 (29)	Beyond Food Promotion: A Systematic Review on the Influence of the Food Industry on Obesity-Related Dietary Behaviour among Children	Yes	‘... food advertising results in increased preferences for HFSS products and requests to parents to buy these products ... [and] food advertising increases children’s consumption of energy-dense food; and overweight children are particularly vulnerable to food advertising ...’ (p8570)	Evidence shows advertising influences children’s preferences and consumption. One longitudinal study did not detect an effect on bodyweight.	Consider short-term versus long-term exposure and effects on behaviour.
Sadeghirad et al 2016 (30)	Influence of unhealthy food and beverage marketing on children’s dietary intake and preference: a systematic review and meta-analysis of randomized trials	Yes	‘The evidence indicates that unhealthy food and beverage marketing increases dietary intake (moderate quality evidence) and preference (moderate to low quality evidence) for energy-dense, low-nutrition food and beverage. Unhealthy food and beverage marketing increased dietary intake and influenced dietary preference in children during or shortly after exposure to advertisements.’ (p945)	Evidence shows immediate effects of advertising on children’s consumption.	Consider short-term versus long-term exposure and effects on behaviour.



Author year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
Boylard et al 2016 (31)	Advertising as a cue to consume: a systematic review and meta-analysis of the effects of acute exposure to unhealthy food and nonalcoholic beverage advertising on intake in children and adults	Yes	‘Subgroup analyses showed that the experiments with adult participants provided no evidence of an effect of advertising on intake, but a significant effect of moderate size was shown for children, whereby food advertising exposure was associated with greater food intake ... Evidence to date shows that acute exposure to food advertising increases food intake in children but not in adults. These data support public health policy action that seeks to reduce children’s exposure to unhealthy food advertising.’ (p519)	Children are particularly susceptible to marketing exposure, increasing their food intake.	Consider short-term versus long-term exposure and effects on behaviour. Consider impacts on adolescents.
Velazquez et al 2017 (32)	Food and Beverage Marketing in Schools: A Review of the Evidence	Yes	‘... exposure to school-based food and beverage marketing was associated with food purchasing or consumption, particularly for minimally nutritious items.’ (p1)	Marketing in schools increases purchase and consumption.	Consider contexts for advertising: and the ‘endorsement’ effect of schools.
Buchanan et al 2018 (33)	The Effects of Digital Marketing of Unhealthy Commodities on Young People: A Systematic Review	Yes	Significant detrimental effects of digital marketing on the intended use and actual consumption of unhealthy commodities were revealed in the majority of the included studies. ... One of the key findings was that marketers used peer-to-peer transmission of messages on social networking sites (e.g., friends’ likes and comments on Facebook) to blur the boundary between marketing contents and online peer activities. Digital marketing of unhealthy commodities is associated with young people’s use and beliefs of these products. The effects of digital marketing varied between product types and peer endorsed marketing (earned media) may exert greater negative impacts than owned or paid media marketing. (p1)	Digital marketing exposure among adolescents and young adults can influence product consumption.	Consider how to measure digital marketing exposure, and include non-paid-for ‘viral’ peer-to-peer product promotion.
Folkvord and van ‘t Riet 2018 (34)	The persuasive effect of advergames promoting unhealthy foods among children: A meta-analysis	Yes	‘Results showed that advergames promoting unhealthy foods induced unhealthy eating behavior among children. Although only a limited number of studies were included, this meta-analysis supports public health policy action that seeks to reduce children’s exposure to	Advergaming platforms can influence unhealthy eating behaviour	Consider how to measure digital marketing exposure in a range of entertainment platforms.



Funded by the Horizon 2020
Framework Programme
of the European Union
GA: 774548



Author year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
			unhealthy digital food marketing. Stricter regulation to protect children against new forms of (online) marketing techniques that promote unhealthy foods should be developed and implemented.’ (p245)		
Russell et al 2019 (35)	The effect of screen advertising on children's dietary intake: A systematic review and meta-analysis	Yes	‘Food advertising was found to increase dietary intake among children ... for television (TV) advertising and advergames... There was also an effect by body mass index (BMI). Findings from nonexperimental studies revealed that exposure to TV food advertising was positively associated with and predictive of dietary intake in children. Short-term exposure to unhealthy food advertising on TV and advergames increases immediate calorie consumption in children.’ (p554)	Marketing on TV and in advergames may increase food intake and bodyweight.	Consider short-term versus long-term exposure and effects on behaviour. Consider impacts on adolescents.
Smith et al 2019 (36)	Food Marketing Influences Children’s Attitudes, Preferences and Consumption: A Systematic Critical Review	Yes	‘Significant detrimental effects of food marketing, including enhanced attitudes, preferences and increased consumption of marketed foods were documented for a wide range of marketing techniques, particularly those used in television/movies and product packaging.’ (p1)	Provides ‘strong evidence’ to support the restriction of food marketing to children.	Consider the need for evidence linking marketing exposure to BMI in longitudinal studies.
Qutteina et al 2019 (37)	Media food marketing and eating outcomes among pre-adolescents and adolescents: A systematic review and meta-analysis	Yes	‘... food marketing has a small but consistent effect on pre-adolescent and adolescent eating outcomes in general and increased unhealthy eating-related behaviors specifically (such as purchase and consumption).’ (p1715) ‘...findings support policy actions specific to the regulation of food marketing targeting adolescents. Most conduct codes are self-regulated and, more importantly, their scope only involves children up to 12 years old... This review provides evidence to support the need for policy actions to protect adolescents from food marketing including print and audio-visual media marketing.’(p1717)	Marketing exposure influences adolescents’ eating patterns, as well as those of younger children	Consider vulnerability of children in older age groups. Consider how dietary habits set in earlier childhood may influence adolescent eating patterns.
Lobstein et al 2020 (1)	Costs, equity and acceptability of three policies	Yes	Restrictions on child-directed advertising are likely to be highly cost-effective in the longer term, moderately	Marketing restrictions are likely to reduce	Consider different advertising formats etc,



Author year (reference)	Title	Includes European studies?	Main finding	Direction of finding	Research implications
	to prevent obesity: A narrative review to support policy development		favourable for health equity, supported by the public, health professionals and civil society groups and opposed by commercial interests (unless voluntary). (p562)	health inequity, be cost-effective and publicly acceptable.	age groups and socio-economic positions.
Backholer et al 2021 (38)	Differential exposure to, and potential impact of, unhealthy advertising to children by socio-economic and ethnic groups: A systematic review of the evidence	Yes	'Children's exposure to advertising of unhealthy food and nonalcoholic beverages that are high in saturated fats, salt and/or sugar is extensive and increases children's preferences for, and intake of, targeted products.' (p1)	Advertising unhealthy products has an impact on children's preferences and consumption.	Consider effects of marketing on dietary patterns and how these persist in longer-term, with and without further exposure.

Table 4.6. Assessment for systematic reviews: marketing to children

Author year (reference)	PICO table / inclusion criteria (IC) list	Pre-registration	Databases searched	Multi-person selection and extraction	List of excluded studies and reasons	GRADE or similar ratings	Risk of bias assessments	Assessed sources of funding	Authors' funding and COI statements
Carter 2006 (23)	No	No	3	No	No	No	No	No	No
Moise et al 2011 (9)	IC list	No	5	Coding	No	No	No	No	Funding
Díaz Ramírez et al 2011 (24)	IC list	No	3	Not stated	No	No	No	No	No
Galbraith-Emami and Lobstein 2013 (25)	IC list	No	4	Yes	No	No	No	Yes	COI
Chambers et al 2015 (26)	IC list	No	3	Yes	No	No	Yes	Yes	COI
Kelly et al 2015 (27)	IC list	No	5	No	No	No	No	No	No
Kraak and Story 2015 (28)	IC list	No	5	Yes	No	No	Yes	No	Funding, COI
Sonntag et al 2015 (29)	IC list	No	9	Yes	No	Yes	Yes	No	Funding, COI



Author year (reference)	PICO table / inclusion criteria (IC) list	Pre-registration	Databases searched	Multi-person selection and extraction	List of excluded studies and reasons	GRADE or similar ratings	Risk of bias assessments	Assessed sources of funding	Authors' funding and COI statements
Sadeghirad et al 2016 (30)	IC list	No	3	Extraction	No	Yes	Yes	No	Funding, COI
Boyland et al 2016 (31)	IC list	No	5	Yes	No	No	Yes	No	Funding, COI
Velazquez et al 2017 (32)	IC list	No	5	No	No	No	No	No	Funding, COI
Buchanan et al 2018 (33)	IC list	Yes	6	Yes	No	Yes	Yes	No	Funding, COI
Folkvord and van 't Riet 2018 (34)	IC list	No	5	Yes	No	Yes	Yes	No	Funding, COI
Russell et al 2019 (35)	IC list	Yes	14	Yes	No	No	Yes	No	Funding, COI
Smith et al 2019 (36)	IC list	Yes	5	Extraction	No	Yes	Yes	No	Funding, COI
Qutteina et al 2019 (37)	IC list	No	4	Not stated	No	No	Yes	No	COI
Lobstein et al 2020 (1)	PICO table	No	3	Yes	No	No	No	No	Funding, COI
Backholer et al 2021 (38)	IC list	Yes	9	Extraction	No	Yes	Yes	No	Funding

For a discussion of these result please go to Section 5: Discussion.



11 Discussion

This review of systematic reviews which include children the papers they examine, provides remarkably consistent evidence across all three policy areas of interest in the STOP project.

12 Summary of findings

In all the eleven reviews of the effects of health-related taxes there is a consistent direction of the findings, with all reviews finding evidence that the imposition of taxes on less healthy foods or beverages can be expected to reduce consumption, and potentially to improve weight-related outcomes. Taxes that increase prices by 20% are recommended. Where separate data are available, children appear to be affected in the same direction as adults. Subsidies of health-promoting foods may be equally effective. The effects are likely to be related to the initial consumption levels, indicating that higher-consuming population groups would be most likely to respond to price increases. Taxation of some products is publicly acceptable, especially when the revenue is used for health-promotion purposes.

In the six reviews of front-of-pack nutrition labelling there is a consistent direction of findings, with greatest impact likely to be found among nutrition-conscious and health-concerned consumers. The design of the label signalling is an important variable, with the stronger warnings (e.g. black stop signs, red traffic lights or red nutri-scores) likely to have the greatest effect among the widest range of age groups.

In the eighteen reviews of promotional marketing of foods and beverages there is consistent evidence linking exposure to the marketing of less healthy foods to increased consumption, especially in the short-term. A review of the potential 'chain of causation' finds evidence linking children's marketing exposure through to their subsequent weight gain, although the evidence is stronger for some links in the chain than for others, and there is insufficient evidence available to show longitudinal effects within a cohort. The nature of the marketing can be significant: including hours of exposure, repetition of advertisements, the media platform being used, the nature of the message and the characters used to convey the message.

13 Research implications

In Tables 4.1, 4.3 and 4.5 we offer some comments on the implications of the systematic review findings for possible further research needs, especially where this can aid further understanding of the optimum format for policy implementation.

For health-related taxes there is a need for greater clarity on the impacts of taxes at different levels (e.g. comparing 5%, 10% and 20%) and the factors which ensure that price rises are passed through to consumers rather than absorbed by producers or retailers. Price elasticities may need to be more sensitive to population sub-group differences. The impact of subsidies on healthier foods needs to be compared to taxes. The messaging around fiscal interventions needs to be explored, as this may have a separate effect on health behaviour, independent of a change in a product's price.

For front-of-pack nutrition signalling there is a clear need to consolidate research into the format of the signalling, and the need to design signals that are likely to be used across



population groups including children (or those who purchase products on children's behalf). Effective signals may be culture-dependent (as are traffic signals on roads). Research into the messaging around the introduction of front-of-pack signalling may determine whether this can have an independent effect. Research is also needed into the potential for responses from manufacturers to improve health by stealth, i.e. by improving the recipes and formulations of products to reduce the liability of the product to being labelled with a warning.

For children's exposure to promotional marketing, research is needed into children's vulnerability to advertising at different ages, the short and longer-term effects of marketing, and the impact of repetition of advertisements over, say, repeated days and weeks in frequently-watched media. Research is also needed into the preferences set in earlier childhood, when children are at greatest vulnerability to marketing, on their later tastes and preferences when they may be less vulnerable. Digital media remain less well-researched than mass-media, and peer-to-peer 'viral' marketing is very poorly researched.

For all policy levers, there is a need to consider the effects of the policies in isolation compared with the effects of the policies in combination. A systems theory approach would suggest that multiple simultaneous interventions would have a greater effect than the sum of each intervention alone. Equally, systems theory would suggest there is a need in all cases to understand the possible unintended consequences of single and multiple interventions. Such consequences can include reformulation to reduce a product's liability to taxation, or to reduce a product's liability to a warning signal on front-of-pack labels, or manufacturers may reduce their paid-for advertising to children and instead use peer-to-peer and similar viral marketing techniques.

14 Quality assessment

Assessments of the systematic reviews was undertaken based on the AMSTAR-2 set of criteria. Tables 4.2, 4.4 and 4.6 summarise the findings under ten of the questions. It can be seen that earlier reviews tend to have fewer 'Yes' responses to the fulfilment of the criteria, as might be expected as the field has developed. However, it should be noted that few of the systematic reviews pre-registered their protocols (3 of 11 reviews of taxes, 2 of the 6 reviews of front-of-pack labelling, 5 of 18 reviews of marketing). All reviews relied on multiple databases, which is recommended for work in an area where health and social policy overlap.

Virtually all reviews used multiple personnel to extract data, but only one (a Cochrane review) listed the rejected papers and the reasons for rejection. The majority of papers used some form of assessment protocol for evaluating the individual studies they reviewed, and the reviews generally assessed risk of bias (usually as part of the assessment protocol) although the risk of bias assessment was not discussed except where meta-analyses had been done. Very few reviews assessed the funding sources of the papers they had examined included, but the majority of reviews listed their own funding source and gave a statement on the authors' conflicts of interest.

15 Limitations

The research implications discussed in section 5.2 above show what areas of work have not been fully explored in the systematic reviews. For example, we found no reviews of



variations on price elasticities and cross-price elasticities between different sub-groups within a population, or between different countries and cultures.

More importantly, the present review has shown remarkable consistency across different systematic reviews in reaching the same conclusions. However, we have not examined the extent to which reviewers have relied on overlapping, or near-identical, sets of underlying primary studies. There is always a danger that systematic reviews are not independent of each other in their underlying data, providing an apparent consistency between them which may be illusory. In the present case, it can be argued that the reviews use a variety of search strategies and databases, and have a variety of objectives. In terms of overlapping time period for published studies, the most recent reviews are likely to have the greatest pool of studies available, and their conclusions are similar to earlier studies.

An additional problem with much of the research on which the systematic reviews are based is their cross-sectional evidence, showing an association but not causality. Studies following a subject over a period of time tend to be short-term (e.g. laboratory studies showing that exposure to advertisements changes immediate consumption patterns).

16 Conclusion

A set of reviews of the effectiveness of population-wide policies is being undertaken by the World Health Organization, and they include the three themes of specific interest being investigated in STOP project Work Package 4, namely health-related taxation, front-of-pack nutrition signalling, and restrictions on promotional marketing of foods and beverages to children.

In STOP Task 4.1 a systematic review of the contextual issues for these three policies – specifically relating to acceptability, cost and equity issues – was undertaken and submitted as STOP Deliverable 4.1.

In order to further support the Task 4.1, the STOP project has now undertaken two additional systematic reviews, including the ‘review of reviews’, reported in the present document and submitted as STOP Deliverable 4.1a.

The present review found that health-related taxation, front-of-pack nutrition labelling and restrictions on children’s exposure to the advertising of unhealthy foods and beverages should in principle assist in reducing obesity risk for children. The evidence for all three policies is consistent and in one direction only.

Shortfalls in the research evidence base are identified. Due to the cross-sectional nature of the evidence, we cannot show a chain of causality from the intervention to the potential benefit. This is likely to be the case for any public health measure which can only be ‘proven’ through controlled trials with sufficient follow-up times and safeguarded from the effect from external confounding. In the absence of such gold-standard evidence, the findings reported here should be supported by the further research suggested in the Discussion, in order to strengthen and consolidate the evidence available to policy-makers concerned with preventing childhood obesity in Europe.



17 References

1. Lobstein T, Neveux M, Landon J. Costs, equity and acceptability of three policies to prevent obesity: A narrative review to support policy development. *Obes Sci Pract.* 2020;**6**(5):562-583.
2. *Taking action on childhood obesity.* World Obesity Federation and World Health Organization. WHO/NMH/PND/ECHO/18.1. Geneva: WHO, 2018.
3. *Prevalence of overweight among children and adolescents.* WHO Global Health Observatory. Geneva: WHO, 2021.
4. *Taxes on sugary drinks: Why do it?* Geneva: World Health Organization, 2017.
5. *Guiding principles and framework manual for front-of-pack labelling for promoting healthy diets.* Geneva: World Health Organization, 2019.
6. *Set of recommendations on the marketing of foods and non-alcoholic beverages to children.* Geneva: World Health Organization, 2010.
7. Shea BJ, Reeves BC, Wells G, Thuku M, Hamel C, Moran J, Moher D, Tugwell P, Welch V, Kristjansson E, Henry DA. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *BMJ.* 2017;**358**:j4008.
8. Powell LM, Chaloupka FJ. Food prices and obesity: evidence and policy implications for taxes and subsidies. *Milbank Q.* 2009;**87**(1):229-57.
9. Moise N, Cifuentes E, Orozco E, Willett W. Limiting the consumption of sugar sweetened beverages in Mexico's obesogenic environment: a qualitative policy review and stakeholder analysis. *J Public Health Policy.* 2011;**32**(4):458-75.
10. Powell LM, Chiqui JF, Khan T, Wada R, Chaloupka FJ. Assessing the potential effectiveness of food and beverage taxes and subsidies for improving public health: a systematic review of prices, demand and body weight outcomes. *Obes Rev.* 2013;**14**(2):110-28.
11. Cabrera Escobar MA, Veerman JL, Tollman SM, Bertram MY, Hofman KJ. Evidence that a tax on sugar sweetened beverages reduces the obesity rate: a meta-analysis. *BMC Public Health.* 2013;**13**:1072.
12. Alagiyawanna A, Townsend N, Mytton O, Scarborough P, Roberts N, Rayner M. Studying the consumption and health outcomes of fiscal interventions (taxes and subsidies) on food and beverages in countries of different income classifications; a systematic review. *BMC Public Health.* 2015;**15**:887.
13. Olstad DL, Teychenne M, Minaker LM, Taber DR, Raine KD, Nykiforuk CI, Ball K. Can policy ameliorate socioeconomic inequities in obesity and obesity-related behaviours? A systematic review of the impact of universal policies on adults and children. *Obes Rev.* 2016;**17**(12):1198-1217.
14. Wright A, Smith KE, Hellowell M. Policy lessons from health taxes: a systematic review of empirical studies. *BMC Public Health.* 2017;**17**(1):583.
15. Roberts KE, Eells LJ, McGowan VJ, Machaira T, Targett VC, Allen RE, Tedstone AE. A rapid review examining purchasing changes resulting from fiscal measures targeted at high sugar foods and sugar-sweetened drinks. *Nutr Diabetes.* 2017;**7**(12):302.
16. Afshin A, Peñalvo JL, Del Gobbo L, Silva J, Michaelson M, O'Flaherty M, Capewell S, Spiegelman D, Danaei G, Mozaffarian D. The prospective impact of food pricing on



improving dietary consumption: A systematic review and meta-analysis. *PLoS One*. 2017;**12**(3):e0172277.

17. Teng AM, Jones AC, Mizdrak A, Signal L, Genç M, Wilson N. Impact of sugar-sweetened beverage taxes on purchases and dietary intake: Systematic review and meta-analysis. *Obes Rev*. 2019;**20**(9):1187-1204.

18. Campos S, Doxey J, Hammond D. Nutrition labels on pre-packaged foods: a systematic review. *Public Health Nutr*. 2011;**14**(8):1496-506.

19. Hersey JC, Wohlgenant KC, Arsenault JE, Kosa KM, Muth MK. Effects of front-of-package and shelf nutrition labeling systems on consumers. *Nutr Rev*. 2013;**71**(1):1-14.

20. Grummon AH, Hall MG. Sugary drink warnings: A meta-analysis of experimental studies. *PLoS Med*. 2020;**17**(5):e1003120.

21. Hallez L, Qutteina Y, Raedschelders M, Boen F, Smits T. That's My Cue to Eat: A Systematic Review of the Persuasiveness of Front-of-Pack Cues on Food Packages for Children vs. Adults. *Nutrients*. 2020;**12**(4):1062.

22. von Philipsborn P, Stratil JM, Burns J, Busert LK, Pfadenhauer LM, Polus S, Holzapfel C, Hauner H, Rehfues E. Environmental interventions to reduce the consumption of sugar-sweetened beverages and their effects on health. *Cochrane Database Syst Rev*. 2019;**6**(6):CD012292

23. Carter OB. The weighty issue of Australian television food advertising and childhood obesity. *Health Promot J Austr*. 2006;**17**(1):5-11.

24. Díaz Ramírez G, Souto-Gallardo MC, Bacardí Gascón M, Jiménez-Cruz A. [Effect of food television advertising on the preference and food consumption: systematic review]. *Nutr Hosp*. 2011;**26**(6):1250-5.

25. Galbraith-Emami S, Lobstein T. The impact of initiatives to limit the advertising of food and beverage products to children: a systematic review. *Obes Rev*. 2013;**14**(12):960-74.

26. Chambers SA, Freeman R, Anderson AS, MacGillivray S. Reducing the volume, exposure and negative impacts of advertising for foods high in fat, sugar and salt to children: A systematic review of the evidence from statutory and self-regulatory actions and educational measures. *Prev Med*. 2015;**75**:32-43.

27. Kelly B, King MPsy L, Chapman K, Boyland E, Bauman AE, Baur LA. A hierarchy of unhealthy food promotion effects: identifying methodological approaches and knowledge gaps. *Am J Public Health*. 2015;**105**(4):e86-95.

28. Kraak VI, Story M. Influence of food companies' brand mascots and entertainment companies' cartoon media characters on children's diet and health: a systematic review and research needs. *Obes Rev*. 2015;**16**(2): 107–126.

29. Sonntag D, Schneider S, Mdege N, Ali S, Schmidt B. Beyond Food Promotion: A Systematic Review on the Influence of the Food Industry on Obesity-Related Dietary Behaviour among Children. *Nutrients*. 2015;**7**(10): 8565–8576.

30. Sadeghirad B, Duhaney T, Motaghipisheh S, Campbell NR, Johnston BC. Influence of unhealthy food and beverage marketing on children's dietary intake and preference: a systematic review and meta-analysis of randomized trials. *Obes Rev*. 2016;**17**(10):945-59.

31. Boyland EJ, Nolan S, Kelly B, Tudur-Smith C, Jones A, Halford JC, Robinson E. Advertising as a cue to consume: a systematic review and meta-analysis of the effects of



acute exposure to unhealthy food and nonalcoholic beverage advertising on intake in children and adults. *Am J Clin Nutr.* 2016;**103**(2):519-33.

32. Velazquez CE, Black JL, Potvin Kent M. Food and Beverage Marketing in Schools: A Review of the Evidence. *Int J Environ Res Public Health.* 2017 **12**;14(9):1054.

33. Buchanan L, Kelly B, Yeatman H, Kariippanon K. The Effects of Digital Marketing of Unhealthy Commodities on Young People: A Systematic Review. *Nutrients.* 2018;**10**(2):148.

34. Folkvord F, van 't Riet J. The persuasive effect of advergames promoting unhealthy foods among children: A meta-analysis. *Appetite.* 2018;**129**:245-251.

35. Russell SJ, Croker H, Viner RM. The effect of screen advertising on children's dietary intake: A systematic review and meta-analysis. *Obes Rev.* 2019;**20**(4):554-568.

36. Smith R, Kelly B, Yeatman H, Boyland E. Food Marketing Influences Children's Attitudes, Preferences and Consumption: A Systematic Critical Review. *Nutrients.* 2019;**11**(4):875.

37. Qutteina Y, De Backer C, Smits T. Media food marketing and eating outcomes among pre-adolescents and adolescents: A systematic review and meta-analysis. *Obes Rev.* 2019;**20**(12):1708-1719.

38. Backholer K, Gupta A, Zorbas C, Bennett R, Huse O, Chung A et al. Differential exposure to, and potential impact of, unhealthy advertising to children by socio-economic and ethnic groups: A systematic review of the evidence. *Obes Rev.* 2021;**22**(3):e13144.



18 Annex

Search strategies

Search terms for the databases (and number of papers returned) are shown below.

OVID / Medline (PubMed)

Medline definitions

Food	"food"[MeSH Terms] OR "food"[All Fields]
Beverages	"beverages"[MeSH Terms] OR "beverages"[All Fields]
Child	"child"[MeSH Terms] OR "child"[all fields] OR child+[Text Word] OR children[Text Word]
Advertising and marketing	"marketing"[MeSH Terms] OR "marketing"[All Fields] OR ("advertising as topic"[MeSH Terms] OR ("advertising"[All Fields] AND "topic"[All Fields]) OR "advertising as topic"[All Fields] OR "advertising"[All Fields]) OR commercials[All Fields]
Nutrition	"nutritional status"[MeSH Terms] OR ("nutritional"[All Fields] AND "status"[All Fields]) OR "nutritional status"[All Fields] OR "nutrition"[All Fields] OR "nutritional sciences"[MeSH Terms] OR ("nutritional"[All Fields] AND "sciences"[All Fields]) OR "nutritional sciences"[All Fields]
Labelling	"food labeling"[MeSH Terms] OR ("food"[All Fields] AND "labeling"[All Fields]) OR "food labeling"[All Fields] OR ("nutrition"[All Fields] AND "label"[All Fields]) OR "nutrition label"[All Fields]

Fiscal measures (11 results)

((fiscal[All Fields] OR tax[All Fields] OR ("taxes"[MeSH Terms] OR "taxes"[All Fields] OR "taxation"[All Fields]))

AND (("food"[MeSH Terms] OR "food"[All Fields]) OR ("beverages"[MeSH Terms] OR "beverages"[All Fields]))

AND ("child"[MeSH Terms] OR "child"[all fields])

AND ONLY systematic reviews

Labelling (13 results)

("food labeling"[MeSH Terms] OR ("food"[All Fields]

AND "labeling"[All Fields]) OR "food labeling"[All Fields] OR ("nutrition"[All Fields] AND "label"[All Fields]) OR "nutrition label"[All Fields])

AND (((("food"[MeSH Terms] OR "food"[All Fields]) OR ("beverages"[MeSH Terms] OR "beverages"[All Fields]))



AND ("child"[MeSH Terms] OR "child"[all fields])

AND ONLY systematic reviews

Marketing (78 results)

((("marketing"[MeSH Terms] OR "marketing"[All Fields]) OR ("advertising as topic"[MeSH Terms] OR "advertising"[All Fields] OR "advertising"[All Fields]) OR (commercials[All Fields]))

AND ((("food"[MeSH Terms] OR "food"[All Fields]) OR ("beverages"[MeSH Terms] OR "beverages"[All Fields]))

AND ("child"[MeSH Terms] OR "child"[all fields])

AND ONLY systematic reviews

Web of Science

Fiscal (43 results)

# 1	2,451	TS=fiscal OR tax (Review)
# 2	76,340	TS=food OR beverage (Review)
# 3	98,078	TS=child (Review)
# 4	43	#3 AND #2 AND #1

Marketing (39 results)

# 2	76,340	TS=food OR beverage (Review)
# 3	98,078	TS=child (Review)
# 9	29,853	TS=marketing OR advertising (Review)
# 10	296	#9 AND #3 AND #2
# 11	9,953	TS=overweight (Review)
# 12	39	#10 AND #11

Labelling (59 results)

# 2	76,340	TS=food OR beverage (Review)
# 3	98,078	TS=child (Review)
# 5	32,038	TS=label (Review)
# 6	293	#5 AND #3 AND #2
# 7	24,424	TS=nutrition (Review)
#8	59	#7 AND #6

SCOPUS

Fiscal measures (16 results)



TITLE-ABS-KEY (child AND (food OR beverage) AND (fiscal OR tax) AND ("systematic")) AND (LIMIT-TO (DOCTYPE,"re"))

Labelling (40 results)

TITLE-ABS-KEY (child AND (food OR beverage) AND (label+) AND ("systematic")) AND (LIMIT-TO (DOCTYPE,"re"))

Marketing (23 results)

TITLE-ABS-KEY (child AND (food OR beverage) AND (market+ OR advertis+) AND ("systematic")) AND (LIMIT-TO (DOCTYPE,"re"))

Cochrane Reviews

Marketing (6 reviews)

(marketing OR advertising) AND (child) AND (food OR beverages)

Fiscal (3 reviews)

(fiscal OR tax) AND (child) AND (food OR beverages)

Labelling (2 reviews)

(labelling) AND (nutrition) AND (child) AND (food OR beverages)



Table of included studies

Health-related taxes	
Reference number	Source
8	Powell LM, Chaloupka FJ. Food prices and obesity: evidence and policy implications for taxes and subsidies. <i>Milbank Q.</i> 2009; 87 (1):229-57.
9	Moise N, Cifuentes E, Orozco E, Willett W. Limiting the consumption of sugar sweetened beverages in Mexico's obesogenic environment: a qualitative policy review and stakeholder analysis. <i>J Public Health Policy.</i> 2011; 32 (4):458-75.
10	Powell LM, Chriqui JF, Khan T, Wada R, Chaloupka FJ. Assessing the potential effectiveness of food and beverage taxes and subsidies for improving public health: a systematic review of prices, demand and body weight outcomes. <i>Obes Rev.</i> 2013; 14 (2):110-28.
11	Cabrera Escobar MA, Veerman JL, Tollman SM, Bertram MY, Hofman KJ. Evidence that a tax on sugar sweetened beverages reduces the obesity rate: a meta-analysis. <i>BMC Public Health.</i> 2013; 13 :1072.
12	Alagiyawanna A, Townsend N, Mytton O, Scarborough P, Roberts N, Rayner M. Studying the consumption and health outcomes of fiscal interventions (taxes and subsidies) on food and beverages in countries of different income classifications; a systematic review. <i>BMC Public Health.</i> 2015; 15 :887.
13	Olstad DL, Teychenne M, Minaker LM, Taber DR, Raine KD, Nykiforuk CI, Ball K. Can policy ameliorate socioeconomic inequities in obesity and obesity-related behaviours? A systematic review of the impact of universal policies on adults and children. <i>Obes Rev.</i> 2016; 17 (12):1198-1217.
14	Wright A, Smith KE, Hellowell M. Policy lessons from health taxes: a systematic review of empirical studies. <i>BMC Public Health.</i> 2017; 17 (1):583.
15	Roberts KE, Ells LJ, McGowan VJ, Machaira T, Targett VC, Allen RE, Tedstone AE. A rapid review examining purchasing changes resulting from fiscal measures targeted at high sugar foods and sugar-sweetened drinks. <i>Nutr Diabetes.</i> 2017; 7 (12):302.
16	Afshin A, Peñalvo JL, Del Gobbo L, Silva J, Michaelson M, O'Flaherty M, Capewell S, Spiegelman D, Danaei G, Mozaffarian D. The prospective impact of food pricing on improving dietary consumption: A systematic review and meta-analysis. <i>PLoS One.</i> 2017; 12 (3):e0172277.
17	Teng AM, Jones AC, Mizdrak A, Signal L, Genç M, Wilson N. Impact of sugar-sweetened beverage taxes on purchases and dietary intake: Systematic review and meta-analysis. <i>Obes Rev.</i> 2019; 20 (9):1187-1204.
1	Lobstein T, Neveux M, Landon J. Costs, equity and acceptability of three policies to prevent obesity: A narrative review to support policy development. <i>Obes Sci Pract.</i> 2020; 6 (5):562-583.



Front-of-pack labelling	
18	Campos S, Doxey J, Hammond D. Nutrition labels on pre-packaged foods: a systematic review. <i>Public Health Nutr.</i> 2011; 14 (8):1496-506.
19	Hersey JC, Wohlgenant KC, Arsenault JE, Kosa KM, Muth MK. Effects of front-of-package and shelf nutrition labeling systems on consumers. <i>Nutr Rev.</i> 2013; 71 (1):1-14.
20	Grummon AH, Hall MG. Sugary drink warnings: A meta-analysis of experimental studies. <i>PLoS Med.</i> 2020; 17 (5):e1003120.
21	Hallez L, Qutteina Y, Raedschelders M, Boen F, Smits T. That's My Cue to Eat: A Systematic Review of the Persuasiveness of Front-of-Pack Cues on Food Packages for Children vs. Adults. <i>Nutrients.</i> 2020; 12 (4):1062.
22	von Philipsborn P, Stratil JM, Burns J, Busert LK, Pfadenhauer LM, Polus S, Holzapfel C, Hauner H, Rehfues E. Environmental interventions to reduce the consumption of sugar-sweetened beverages and their effects on health. <i>Cochrane Database Syst Rev.</i> 2019; 6 (6):CD012292
1	Lobstein T, Neveux M, Landon J. Costs, equity and acceptability of three policies to prevent obesity: A narrative review to support policy development. <i>Obes Sci Pract.</i> 2020; 6 (5):562-583.
Exposure to promotional marketing	
23	Carter OB. The weighty issue of Australian television food advertising and childhood obesity. <i>Health Promot J Austr.</i> 2006; 17 (1):5-11.
9	Moise N, Cifuentes E, Orozco E, Willett W. Limiting the consumption of sugar sweetened beverages in Mexico's obesogenic environment: a qualitative policy review and stakeholder analysis. <i>J Public Health Policy.</i> 2011; 32 (4):458-75.
24	Díaz Ramírez G, Souto-Gallardo MC, Bacardí Gascón M, Jiménez-Cruz A. [Effect of food television advertising on the preference and food consumption: systematic review]. <i>Nutr Hosp.</i> 2011; 26 (6):1250-5.
25	Galbraith-Emami S, Lobstein T. The impact of initiatives to limit the advertising of food and beverage products to children: a systematic review. <i>Obes Rev.</i> 2013; 14 (12):960-74.
26	Chambers SA, Freeman R, Anderson AS, MacGillivray S. Reducing the volume, exposure and negative impacts of advertising for foods high in fat, sugar and salt to children: A systematic review of the evidence from statutory and self-regulatory actions and educational measures. <i>Prev Med.</i> 2015; 75 :32-43.
27	Kelly B, King MPsy L, Chapman K, Boyland E, Bauman AE, Baur LA. A hierarchy of unhealthy food promotion effects: identifying methodological approaches and knowledge gaps. <i>Am J Public Health.</i> 2015; 105 (4):e86-95.
28	Kraak VI, Story M. Influence of food companies' brand mascots and entertainment companies' cartoon media characters on children's diet and health: a systematic review and research needs. <i>Obes Rev.</i> 2015; 16 (2): 107–126.



29	Sonntag D, Schneider S, Mdege N, Ali S, Schmidt B. Beyond Food Promotion: A Systematic Review on the Influence of the Food Industry on Obesity-Related Dietary Behaviour among Children. <i>Nutrients</i> . 2015; 7 (10): 8565–8576.
30	Sadeghirad B, Duhaney T, Motaghipisheh S, Campbell NR, Johnston BC. Influence of unhealthy food and beverage marketing on children's dietary intake and preference: a systematic review and meta-analysis of randomized trials. <i>Obes Rev</i> . 2016; 17 (10):945-59.
31	Boyland EJ, Nolan S, Kelly B, Tudur-Smith C, Jones A, Halford JC, Robinson E. Advertising as a cue to consume: a systematic review and meta-analysis of the effects of acute exposure to unhealthy food and nonalcoholic beverage advertising on intake in children and adults. <i>Am J Clin Nutr</i> . 2016; 103 (2):519-33.
32	Velazquez CE, Black JL, Potvin Kent M. Food and Beverage Marketing in Schools: A Review of the Evidence. <i>Int J Environ Res Public Health</i> . 2017 12 ;14(9):1054.
33	Buchanan L, Kelly B, Yeatman H, Kariippanon K. The Effects of Digital Marketing of Unhealthy Commodities on Young People: A Systematic Review. <i>Nutrients</i> . 2018; 10 (2):148.
34	Folkvord F, van 't Riet J. The persuasive effect of advergames promoting unhealthy foods among children: A meta-analysis. <i>Appetite</i> . 2018; 129 :245-251.
35	Russell SJ, Croker H, Viner RM. The effect of screen advertising on children's dietary intake: A systematic review and meta-analysis. <i>Obes Rev</i> . 2019; 20 (4):554-568.
36	Smith R, Kelly B, Yeatman H, Boyland E. Food Marketing Influences Children's Attitudes, Preferences and Consumption: A Systematic Critical Review. <i>Nutrients</i> . 2019; 11 (4):875.
37	Qutteina Y, De Backer C, Smits T. Media food marketing and eating outcomes among pre-adolescents and adolescents: A systematic review and meta-analysis. <i>Obes Rev</i> . 2019; 20 (12):1708-1719.
1	Lobstein T, Neveux M, Landon J. Costs, equity and acceptability of three policies to prevent obesity: A narrative review to support policy development. <i>Obes Sci Pract</i> . 2020; 6 (5):562-583.
38	Backholer K, Gupta A, Zorbas C, Bennett R, Huse O, Chung A et al. Differential exposure to, and potential impact of, unhealthy advertising to children by socio-economic and ethnic groups: A systematic review of the evidence. <i>Obes Rev</i> . 2021; 22 (3):e13144.



19 Summary of Deliverable 4.1

Extracted from the Discussion and Conclusion of Deliverable 4.1.

Deliverable 4.1 Discussion

This review sets out to consider the three contextual factors: costs and cost-effectiveness, equity and social inequalities, and acceptability to stakeholders, in relation to three proposed policy options: health-related food taxes, FOP nutrition labelling, and restrictions to reduce children's exposure to and power of food and non-alcoholic beverage marketing.

The reviews undertaken here can at best be only indicative of the material available. As we have noted, the research material is sparse and uneven across the themes and policies. For example, estimating the costs and effectiveness of interventions has largely relied on modelling methods in a limited number of countries, and these have rarely been validated against actual policy interventions and their sustained effects over time.

Similarly, demonstration of inequities or social disparities arising from specific policies depends on factors such as differential exposure to the initial risk and to the intended intervention, differential responses and alternative response strategies. Sub-group cross-price elasticities may be significant in some contexts and not others, and may fluctuate under external influences such as promotional advertising campaigns, social marketing campaigns and media stories.

Even harder to review comprehensively is the acceptability of policies to stakeholders. Collating the variety and nuance of views across a range of interested parties even in a single member state is a significant research task and has been undertaken in only a few countries. The views and stated positions change over time, and are likely to be influenced by media stories or media personalities such as Jamie Oliver, as well as by the underlying beliefs and ideological positions held, on the relative importance of social determinants of behaviour or individual responsibility and freedom of choice.

Despite these caveats, some generalisations can be made and patterns of evidence described and summarised here:

Cost and cost-effectiveness

All three policy interventions have evidence in favour of being cost-effective, indeed cost-saving, when comparing estimates of the cost of implementing and maintaining an intervention against the health care savings predicted to accrue from the intervention. The health care savings are likely to be underestimates as not all health benefits are considered, nor the savings from reduced social care and increased economic productivity gained from improvements in population health. In the forthcoming OECD analysis of cost-effectiveness of policies for obesity, better food and menu labelling is anticipated to have a significant impact in the near term, while restrictions on marketing to children has the greatest impact long-term, providing \$6.6 saving for \$1 invested. Health-related food taxes are not assessed in the OECD study.

Equity and social disparities

Two case studies, Hungary and Mexico, provide the most substantial evidence of the impact of food taxes on different social groups by income or education levels. Both show



a favourable effect, reducing consumption and reducing expenditure on the taxed foods and beverages.

The differential effects of front-of-pack food labelling are dependent on the format of the FOP nutritional information: those formats requiring least literacy or numeracy have greater impact on lower-educated or lower-income consumers. In addition, to the extent that FOP panels drive reformulation, all consumers benefit to the degree that they replace the original with the reformulated products in their diets.

Children's exposure to marketing may have a social gradient, though this is not necessarily the case in all countries as it depends on having easy access to the available media. Restrictions to marketing will benefit children in proportion to their initial exposure. Digital marketing channels are largely unexplored in terms of children's exposure differentiated across household income, parental education or ethnic group.

Stakeholder acceptability

A number of conclusions can be drawn from the evidence described here on stakeholder views. Stakeholders with commercial interest in the sale of HFSS foods can be expected to resist any forms of interference in their market activities, be it through raised prices, front-of-pack information, or restricted marketing.

In contrast, stakeholders concerned with health or consumer protection generally favour increased access to information on processed food packs (especially when these are easily understood) and to the protection of children from commercial inducements to unhealthy behaviour. Increased prices of snacks or sugar-sweetened beverages may meet public resistance, and should be mitigated with subsidies for healthier products or with guarantees that the revenue raised from the taxes will be used for socially valuable purposes – in the UK this was for school sports, in Hungary for public health services.

Deliverable 4.1 Conclusion

The WHO is undertaking systematic reviews of the effectiveness of policy actions to improve food environment in order to promote healthy diets, such as fiscal and pricing policies, nutrition labelling policies (including ingredient lists, nutrient declarations, nutrition claims, and front of pack labelling), and policies to restrict marketing to children. In forming policy guidelines for member states, the WHO also seeks to consider a number of contextual factors, as we have listed in the introduction, and to take these contextual factors into consideration when determining the strength of the policy guideline.

From the literature review undertaken here we make the following summary assessments:

Fiscal policies (health-related food taxes): *Highly cost-effective, moderately favourable for health equity, moderately supported by public (depending on the use of revenues), strongly supported by health professionals and NGOs, and moderately opposed by commercial interests.*

Front-of-pack nutritional labelling: *Highly cost-effective, moderately favourable for health equity (especially when not purely numerical), moderately supported by public, strongly supported by health professionals and NGOs (depending on the format) and moderately opposed by commercial interests (depending on the format).*

Front-of-pack red or black clear warnings: *Likely highly cost effective, likely highly favourable for health equity, likely moderately supported by public, highly*



Funded by the Horizon 2020
Framework Programme
of the European Union
GA: 774548



supported by NGOs and health professionals, and highly opposed by commercial interests.

Restriction of children's exposure to marketing: *Very highly cost-effective (in the longer term), moderately favourable for health equity, moderately supported by public, strongly supported by health professionals and NGOs, moderately opposed by commercial interests (unless voluntary).*

Based on these assessments, we believe that all three policy interventions merit adoption and promotion by international and national authorities.



Supplementary D4.1b: A systematic review of the impact of three population-wide policies on socio-economic disparities in child obesity

20 D4.1b Executive summary

In the EU-funded STOP project three policy interventions are identified for detailed research in WP4: (i) health-related taxes on foods or beverages; (ii) front-of-pack nutrition labelling; (iii) restricting children’s exposure to food and beverage advertising.

Task 4.1 of the STOP project states: *‘The work of WP4 will start with a systematic review and synthesis of the evidence available from studies that have assessed the effectiveness of policy options falling within the domain of this work package. In areas in which systematic reviews have been undertaken previously, STOP will update these reviews and compile “reviews of reviews”, as appropriate.*

After commencement of the STOP project, one of the partners, the World Health Organization (WHO), stated they were funding a global evidence review of the three policy areas identified for WP4. To avoid duplicating work in progress, the STOP project consulted with the WHO and proceeded to produce a narrative review of three key contextual issues not being covered in the WHO reviews: namely the contextual issues of equity, acceptability and costs of the three policy areas. This was submitted in the first reporting period in 2019 as Deliverable 4.1, and subsequently published in a peer-reviewed journal in 2020 (1). A summary of Deliverable 4.1 is given in Annex 8.3 at the end of the present document.

At the first review, the reviewers made the following request:

<i>Deliverable D4.1:</i>	<p><i>The results of the WHO reports should be reported here at least briefly, otherwise the deliverable is rather pointless.</i></p> <p><i>Tables of included studies need to be added, and information of overlap and gaps of included studies with the WHO reviews is missing. The WHO included studies should be checked for relevance for inclusion in the STOP reviews.</i></p> <p><i>An updated version should be provided at the end of the next reporting period.</i></p>
--------------------------	--

(Source: General Project Review Consolidated Report)

The WHO reviews remain in preparation (at May 2021). In order to support the work of Work Package 4, and in the absence of the WHO reviews, the STOP project has undertaken two further systematic reviews to support the work of Work Package 4. The first, **Supplementary Deliverable 4.1a**, is a ‘review of reviews’ of the three policy measures, as specified in Task 4.1 and with a specific focus on how the policies might affect children. The second, **Supplementary Deliverable 4.1b**, is a systematic review of published primary research studies, asking whether the three policy measures may serve to reduce or increase the disparities in obesity prevalence between children in higher and lower socio-economic groups.



The results of these two additional reviews are designed to support the work undertaken in Task 4.2, to compare the effects of fiscal policies on children overall diet, weight loss, and health with specific attention paid to socio-economically disadvantaged children. They will also support Task 4.3, concerning sensitivity of shoppers for children's food products to labelling and pricing, across socio-economically differentiated households, and Task 4.4, which is undertaking modelling work on these same issues. The present document is the review of primary research on the effects on obesity prevalence disparities, submitted as **Supplementary Deliverable 4.1b**.

Results: For health-related taxes, one study met the inclusion criteria, and this study indicated that such taxes would reduce socio-economic disparities in childhood overweight. For marketing restrictions, 15 studies met the inclusion criteria, of which the large majority indicated that restrictions to limit children's exposure to advertising for foods and beverages would also likely reduce disparities in childhood overweight. There were no studies on the effects of front-of-pack labelling. A GRADE analysis found that most studies were of low or moderate quality.

Discussion: The lack of robust evidence led the authors to examine published systematic reviews that include both European and non-European studies. These reviews support the statements above, and add some evidence on front-of-pack labelling, suggesting that this may have little impact on social disparities in childhood overweight and may even increase these disparities, but that the most easily understood formats for front-of-pack information would be of greatest benefit for children in lower-income or less well-educated households.

The present review also found that many studies collected relevant demographic information to categorise the participants' socio-economic status, or collected information on children in the samples, but did not then report their findings differentiated by socio-economic grouping, or age group, or by children in the household. This is a lost opportunity for providing valuable evidence for policy-making. Research funding bodies concerned with the prevention of childhood obesity should ensure that health equity issues are prioritised.



21 Background

Over 40 million children between the ages of 5-19 years old were affected by overweight or obesity across Europe (WHO region) in 2016, representing a 12% increase since 2010 (2). In a few countries as many as 40% of older children are affected (3). It is now well-established that in most countries in the region the risk of childhood overweight and obesity is higher in households of lower socio-economic affluence or lower parental educational attainment, shown in surveys of measured heights and weights in younger children (4), and older children (5), and self-reported heights and weights (6), and using both World Health Organization (WHO) and International Obesity Task Force (IOTF) criteria for classifying body mass index (BMI) in children. In the most comprehensive survey, the Health Behaviour of School-Children study of young people aged 11-13 years old in 45 countries and sub-regions of the WHO European region, it was found that over half of the populations surveyed showed significantly higher likelihood of overweight among children in less affluent families. None of the surveyed samples showed significantly lower likelihood of overweight among children in these families.

Policy makers wishing to assess the impact of policies to address obesity may want to consider how these policies might widen or narrow the socio-economic differences in obesity risk. This present review considers three widely considered policies for addressing obesity and improving nutritional health in the European region and asks what evidence is available for the potential impact of these policies as they may affect children, and in respect of socio-economic disparities.

There is some evidence that the association between risk of obesity in childhood and socio-economic status is mediated by factors including consumption of sugary drinks and television watching (7). Policies directed towards reducing sugary drinks consumption and reducing television viewing in an attempt to reduce exposure to food and beverage advertising, might be expected to reduce the disparities in obesity prevalence between different social groups, and the current review sought evidence to support or refute this suggestion.

Obesity prevention policies have been debated in most European member states as well as in leading intergovernmental institutions, including the Council of Europe, the WHO, and the UN General Assembly, with increasing interest in population-wide interventions including fiscal measures (8), front-of-pack nutrition labelling (9), and marketing restrictions (10). These policy areas are the focus of the present report.

In the EU-funded STOP project three policy interventions are identified for detailed research in Work package 4 (WP4). These are:

- fiscal policies (i.e. health-related taxes or levies imposed on food and non-alcoholic beverages);
- regulation of food labelling (particularly the provision of front-of-pack nutrition information);
- regulation of the marketing of food products to children (including the extent of exposure and the power of advertising, and the media platforms used).

WP4 includes as its first task a review of the available evidence concerning these policies. Task 4.1 of the STOP project states:

The work of WP4 will start with a systematic review and synthesis of the evidence available from studies that have assessed the effectiveness of policy options falling within the domain of this work package. [...] The focus of the systematic review in WP4 will be threefold, including fiscal policies (food and non-alcoholic beverages); regulation of food labelling; and regulation of the marketing of food products to children. In areas in which



systematic reviews have been undertaken previously, STOP will update these reviews and compile “reviews of reviews”, as appropriate.

22 Variation of the task T4.1

After the award of the STOP project grant it was learnt that the WHO intended to commission a number of systematic reviews of health-related policy interventions as part of their guideline development process, and their commissions included systematic reviews of the three policies described above for WP4, namely fiscal policies, nutrition labelling policies and policies to restrict marketing to children. The reviews were being undertaken in the latter half of 2018 and the year of 2019, and due to be presented to the WHO's expert advisory group meeting in December 2019.

In consultation with the WHO it was considered that a better use of the STOP effort would be to supplement the systematic reviews commissioned by the WHO with a set of contextual reviews. These were undertaken in respect of three cross-cutting areas of concern in relation to the three policy areas: costs, acceptability, and equity. The results were submitted as Deliverable D4.1 in July 2019. The results were also published in a peer reviewed journal in mid-2020 (1).

At its first review of the STOP project, the European Commission requested a supplement to Deliverable 4.1 which would include a summary of the WHO systematic reviews. Unfortunately, by May 2021 the WHO reviews had not been published, and the supplementary work requested by the Commission would not be possible during the second review period. In order to provide additional support to Work Package 4, the STOP project has undertaken an additional systematic review consistent with, and in support of, WP4 Task 4.1, and submitted as Deliverable 4.1b, the present document.

The primary objective of the present review is to strengthen the evidence base for policy development. Specifically, we wish to examine the evidence available on whether policies in the three areas outlined above and their impact on children, and specifically whether the policies are likely to narrow the social disparities in the risk of obesity or widen them, using evidence produced in the European region (the member states of the WHO European Region).

A secondary objective is to identify evidence gaps. The present review considers areas where evidence is missing and summarises these in table form. The present review also identifies a problem of un-reported evidence, i.e. research studies which collect relevant information but do not report it. This should shape the future priorities for research funding agencies, including the priorities of the European Union's research programmes.



23 Methods

The present review systematically investigates the peer-reviewed evidence available in relation to three types of policy intervention: fiscal policies (e.g. health-related food and beverage taxes); front-of-pack (or menu display) nutrition labelling; and restrictions to limit children’s exposure to the promotional marketing of foods and beverages. The search for evidence is focused on studies that report quantified data relating to children differentiated according to background measures of socio-economic disparity, undertaken in the European context (defined here as the WHO European Region). It includes evidence relating to exposure to risk, vulnerability to the effects of risk-creating environments, and the effects of measures to reduce risk.

In order to clarify the task of the systematic review, the following PICO (population, interventions, comparisons, outcomes) table was constructed for the three policy interventions:

Table 3.1. PICO for three policy interventions

PICO feature	Health-related food and beverage taxes	Front-of-pack nutrition labelling	Exposure to promotional marketing of food and beverages
Population	Children (< 18 years), WHO European Region	Children (< 18 years), WHO European Region	Children (< 18 years), WHO European Region
Interventions	Fiscal interventions using taxes, levies, duties or tariffs introduced for health-related purposes.	Interventions to provide nutritional information on the front panels of packaged foods and non-alcoholic beverages. Excludes nutrition or health claims. Excludes quantitative ingredient listing. Excludes nutrition information panels on side or rear of pack.	Actions to restrict children’s exposure to commercial messages for foods and non-alcoholic beverages, or to reduce the strength or impact of those messages.
Comparisons	Controlled cross-sectional and longitudinal interventions, uncontrolled survey and observational evidence, interrupted time-series, modelled interventions.		
Outcomes	Measures of exposure, vulnerability, consumption, bodyweight or diet-related health, differentiated in sub-groups defined according to social disparities (<i>including</i> socio-economic status, income, occupation, education, neighbourhood deprivation, ethnicity, migrant-status or similar disparity measure; <i>excluding</i> gender, disability, religion, language).		

For the analysis of evidence gaps, the following two tables were constructed:

Table 3.2: Types of study on child-related SES disparities in Europe.

	Health-related taxes	Front-of-pack nutrition labelling	Marketing restrictions
Controlled experimental studies			
Self-reported and parental reported survey studies			
Geographical mapping studies			
Modelling			
Systematic reviews			
Meta-analyses			



Table 3.3: Studies identified in Table 3.2 which differentiate specific aspects of the policies

	Studies on children and inequalities related to specific policy aspects
Health-related food and beverage taxes: <i>comparison by types of products taxed</i>	
Health-related food and beverage taxes: <i>comparison of format of tax (sales tax, production levy, product subsidy, etc)</i>	
Front-of-pack nutrition labelling: <i>comparison of label formats</i>	
Marketing platforms: <i>comparison of media platforms</i>	
Marketing products: <i>comparison of nutrient profiling schemes</i>	
Marketing methods: <i>comparison of promotional formats (e.g. cartoon, celebrity)</i>	
Marketing methods: <i>comparison of TV advertising schedules or audiences</i>	

24 Search Protocol

Searches were undertaken January 14-15, 2021. No limits were set on the date of publication. No language limits were set.

Databases searched were (i) OVID/Medline, (ii) SCOPUS, (iii) Web of Science, (iv) Cochrane Library and (v) Cochrane CENTRAL. References in the included papers were also examined for additional studies that might be eligible for inclusion.

Search terms used for each database are shown in Annex 8.1. Effectively they included;

(i) (food OR beverages) AND (child+) AND (disparit+ OR equity OR socio-economic OR [other SES indicators]) AND (fiscal OR [taxation terms])

(ii) (food OR beverages) AND (child+) AND (disparit+ OR equity OR socio-economic OR literacy OR [other SES indicators]) AND (label+)

(iii) (food OR beverages) AND (child+) AND (disparit+ OR equity OR socio-economic OR [other SES indicators]) AND (advertising OR [marketing terms])

Papers were examined by title, abstract and in full, to determine whether they met the inclusion criteria specified in the PICO table above. In the papers that were examined in full the references cited were also examined for additional papers that potentially met the inclusion criteria.

Two researchers examined the database results and data extraction, with disagreements settled by discussion. Extracted information was tabulated and also assessed by GRADE evaluation (11), and additionally entered into the 'Gaps analysis' tables. The GRADE evaluations and gaps analyses were undertaken by one researcher and cross-checked and validated by the second researcher, and disagreements settled by discussion.



25 Results

The search of the five databases gave the results shown in the Prisma charts below. Searches for health-related taxes provided 278 titles, for front-of-pack labelling 440 titles, and for promotional marketing 1314 titles. After removal of duplicates, the titles and abstracts were inspected and excluded if they did not describe evidence in the European region relating to effects on children, with differentiation by social disparity, as shown in the PICO table (Table 3.1).

A total of 170 records were identified from the databases for full examination. Additional papers were added for full examination based on references cited in the included studies and reviews, bringing the total to 261 papers for full examination:

- Health-related taxes: n = 33 plus 22 added
- Front-of-pack nutrition labelling: n = 30 plus 26 added
- Interventions to restrict marketing to children: n = 107 plus 43 added

After examination of the full texts, the following number of papers were included for data extraction:

- Health-related taxes: n = 1
- Front-of-pack nutrition labelling: n = 0
- Interventions to restrict marketing to children: n = 15

Fig 4.1. PRISMA chart for health-related taxes

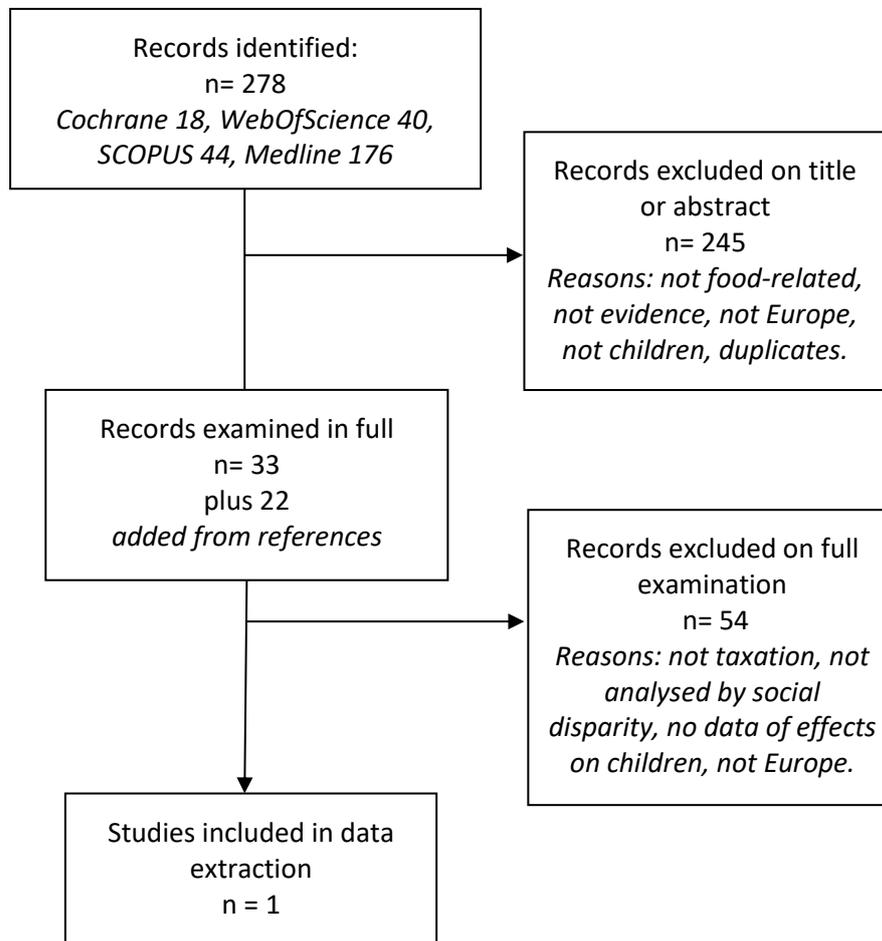


Fig 4.2. PRISMA chart for front-of-pack nutrition labelling

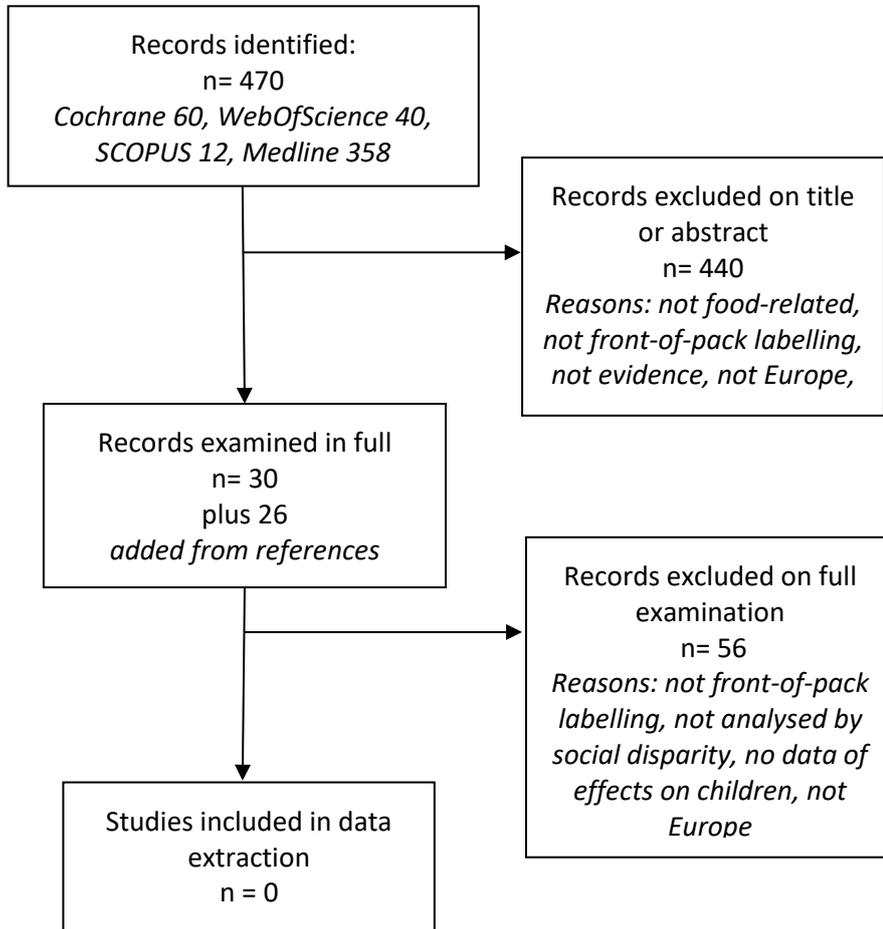
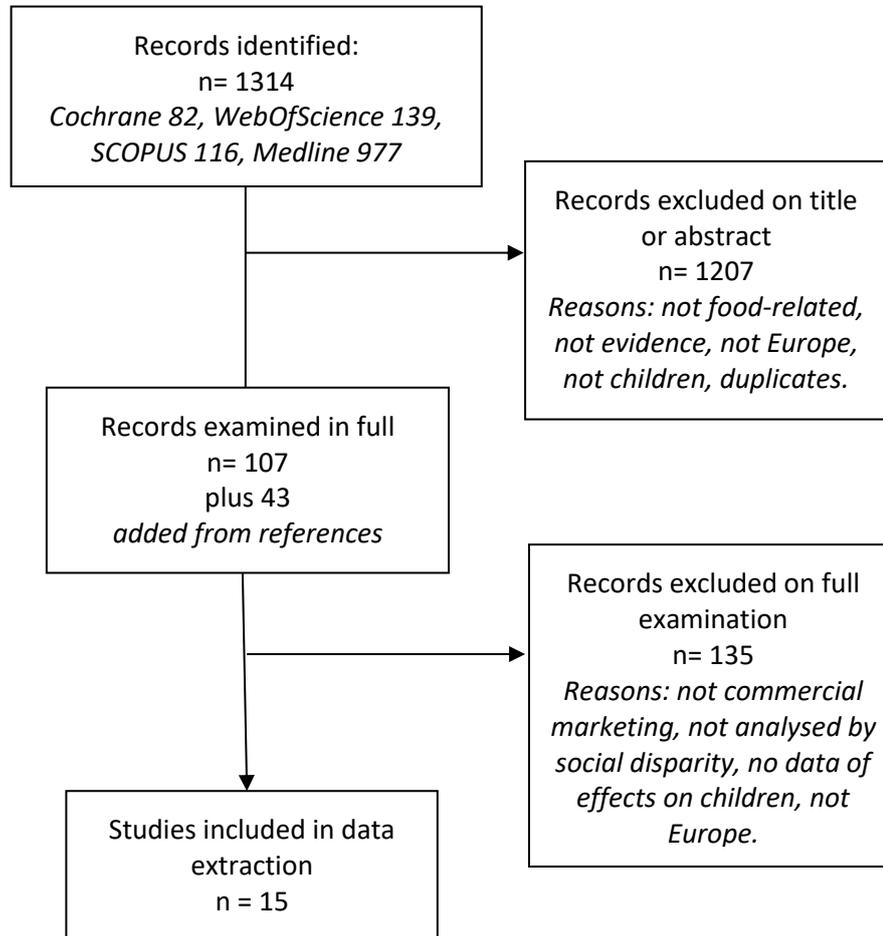


Fig 4.3. PRISMA chart for marketing to children



26 Health-related taxes

One study met the inclusion criteria, shown in Table 4.1

Table 4.1. Papers meeting the inclusion criteria: health-related taxes

Authors, date, country	Title	Summary of methods	Impact measures	SES-differentiated results
Schwendicke and Stolpe, 2017, Germany (12)	Taxing sugar-sweetened beverages: impact on overweight and obesity in Germany	Modelling study: to estimate the tax effect on population groups including adolescents aged 15-19 years	Taxation of 20% was assumed to affect energy consumption via demand elasticities, which affected weight and BMI	Reductions in daily energy consumption, and reduction in average BMI, greatest in low-income adolescents, and least in high-income adolescents, both males and females.

This one study showed the effects on adolescents' consumption of sugar-sweetened beverages following a hypothetical increase in price of 20%. The distribution of the effects



followed the levels of previous consumption: those consuming higher amounts of sugar-sweetened beverages showed greater reductions in consumption and therefore greater decline in BMI. The survey data on which the study was based show adolescents from lower income households consume the most sugar-sweetened beverages, those from higher-income households the least, and those from middle-income households an intermediate amount. The health benefits in terms of reductions in BMI were therefore graduated across the income levels, with the greatest benefit among adolescents from lower income households (Table 4.2).

Table 4.2. Summary of estimated impact of 20% tax on sugar-sweetened beverages on adolescents aged 15-19 years

Income group	Change in per capita energy consumption (kJ/day)		Change in overweight prevalence		Change in obesity prevalence	
	Male	Female	Male	Female	Male	Female
High	-34	-45	-8	-7	0	0
Middle	-65	-68	-9	-9	-12	-11
Low	-166	-172	-13	-12	-16	-16

A GRADE assessment of the quality of the study (shown in Table 4.3) rated it as ‘Low’ primarily on the basis that it made a number of assumptions whose effects are not fully assessed. These include an assumed generalised price elasticity across all population groups, a narrow range of the effect of the tax on the retail price (the ‘pass-through’ of costs), and an assumed steady-state model of reduced beverage consumption following the introduction of the tax.

Table 4.3. GRADE assessment of included studies.

Study	Study design	Risk of bias: • sample size • representativeness • attendance /drop-outs • control group • statistical tests	Imprecision	Inconsistency across results	Indirectness, assumptions	Other considerations	Overall GRADE assessment of certainty
Schwendicke and Stolpe 2017 (12).	Modelling of effects on consumption and BMI based on price elasticity of sugar-sweetened drinks.	Sample size adequate. Price elasticities not available for German adolescents, so assumed from other populations. Attendance and control groups not included in model. Statistical tests appropriate.	Standard errors shown.	Results consistent within study design. (Externally consistent with findings from non-European studies: see discussion.)	Assumed relation between price, consumption and BMI. Assumed pass through of tax 100% and 80%. Assumed steady-state of reduced consumption.	Some sensitivity testing for assumptions about elasticities.	Low: The true effect might be markedly different from the estimated effect due to assumptions listed.

For a discussion of these results please go to Section 5: Discussion.



27 Front-of-pack nutrition labelling

No studies met the inclusion criteria. Several relevant papers examined front-of-pack labelling and socio-economic variables, and some examined households with and without children, but no studies provided evidence cross-tabulating socio-economic variables differentiated by the presence of children or an indication of younger age-groups.

For a discussion of this result please go to Section 5: Discussion.

28 Marketing to children

Fifteen studies met the inclusion criteria, shown in Table 4.4. With the exception of a 2019 paper by Griffith et al 2019 (13), the included papers do not specifically address the impact of policies to restrict marketing, but consider the extent of children's exposure to marketing in relation to SES variables including neighbourhood deprivation index, household income and parental education, and assess the possible effects. The paper by Griffith et al. directly addresses a specific policy question, i.e. whether a restriction on TV advertising of unhealthy food products prior to 9pm would have an effect on children's exposure differentiated by their families' socio-economic classification. This is a modelling study using market data from commercial sources. It found that the policy would reduce exposure, and would do so more for children in lower SES groups, even if the industry increases advertising at other times or on other platforms.

Four of the fifteen papers included here were given a 'Low' GRADE score as a result of having substantial weaknesses in their assumptions or their design. Nine studies were given a 'Moderate' GRADE score on the basis that the study had some weaknesses or design issues which compromised their findings. Three studies papers merited a 'High' GRADE score on the grounds that they were well designed with good sample sizes.

In none of the studies was there a test of the complete logic chain: from exposure through product purchase, to sustained increases in consumption by children, to long-term increase in bodyweight, assessing socio-economic disparities. As a result no study provided a high-grade and robust answer to assist policy-makers in policy-formation for reducing health inequalities.

It should be noted that many more papers than those shown here collected information on children's socio-economic status, but then adjusted for this variable when reporting their findings. This issue will be raised in Section 5: Discussion.



Funded by the Horizon 2020
Framework Programme
of the European Union
GA: 774548



Table 4.4. Papers meeting the inclusion criteria: marketing.

Author, date, country	Title	Summary of methods	Impact measures	SES-differentiated results
Aljawad et al 2016, UK (14).	The availability of novelty sweets within high school localities	Mapping of availability of low-cost confectionery in retailers near schools.	Products available, prices.	Areas of deprivation are associated with increased availability.
Buijzen et al 2008, The Netherlands (15).	Associations between children's television advertising exposure and their food consumption patterns: a household diary-survey study.	Diary-based assessment of children's exposure to specific advertising and food consumption patterns.	Products consumed in relation to advertising seen.	Household income level not correlated with advertising exposure, positively associated with consumption of advertised products and negatively with consumption of unhealthy products and total food quantity.
Cetateanu & Jones 2014, UK (16).	Understanding the relationship between food environments, deprivation and childhood overweight and obesity: Evidence from a cross sectional England-wide study	Survey of prevalence of unhealthy food retailers and local child overweight prevalence. Also, bootstrap modelling of possible effects.	Weight status in relation to retailer density.	Overweight associated weakly with density of unhealthy outlets, not overall outlets. Area deprivation index does not explain association.
Gatou et al 2016, Greece (17).	The short-term effects of television advertisements of cariogenic foods on children's dietary choices.	Experimental exposure to advertisements and subsequent food choices	Types of food chosen, tooth decay status, obesity status.	No significant differentiation of effect of advertisements on food choices according to socio-economic status of parents.
Gebremariam et al 2017, Belgium, Greece, Hungary, the Netherlands, Norway, Slovenia, Spain, Switzerland (18).	Screen-based sedentary time: association with soft drink consumption and the moderating effect of parental education in European children: The ENERGY study.	Cross-sectional surveys of child screen-viewing and soft drink consumption.	TV screen exposure time and computer screen time, soft drink consumption.	In two countries, association between TV viewing and soft drink consumption was strongest in families with lower-educated parents..
Giese H et al 2015, Finland, Germany, Romania (19).	Exploring the association between television advertising of healthy and unhealthy foods, self-control, and food intake in three European countries.	Survey of schoolchildren, self-reported exposure to TV advertising, self-reported diet diary.	Recall of advertisements, fruit and vegetable consumption, fast food consumption.	In Germany only, significant correlation between higher social affluence and lower exposure to unhealthy advertisements, and less unhealthy food consumption.



Funded by the Horizon 2020
Framework Programme
of the European Union
GA: 774548



Author, date, country	Title	Summary of methods	Impact measures	SES-differentiated results
Griffith et al 2019, UK (13).	The potential impacts of banning television advertising of HFSS food and drink before the watershed	Modelling of impact of reduced TV advertising exposure in families with children.	Minutes of advertising of HFSS foods, and proportion of consumers exposed to >10 minutes per day.	Lower-income households would experience greater reduction of exposure.
Kapetanaki AB et al 2019, UK (20).	Socioeconomic Differences and the Potential Role of Tribes in Young People's Food and Drink Purchasing Outside School at Lunchtime	Survey of children's self-reported susceptibility to advertising (TV, online, other), purchases and dietary patterns.	Lunchtime food purchases, advertising susceptibility.	No differences in food consumption across SES variables.
Kearney et al 2021, UK (21).	Television advertisements for high-sugar foods and beverages: effect on children's snack food intake	Experimental exposure to advertisements embedded in cartoons and snack food selection.	Consumption of food energy and sugars.	No differences in intake patterns across the five quintiles of SES
Lissner et al 2012, Italy, Estonia, Cyprus, Belgium, Sweden, Germany, Hungary, Spain (22).	Television habits in relation to overweight, diet and taste preferences in European children: the IDEFICS study.	Survey of parents of children aged 2-9 years, including TV viewing and diets. Also BMI.	TV viewing (hours/day), consumption of 43 items during previous week.	Higher parental education associated with lower overweight likelihood, and reduced TV viewing. Otherwise, SES variables were adjusted out of the analyses.
Pérez-Farinós et al 2017, Spain (23).	The relationship between hours of sleep, screen time and frequency of food and drink consumption in Spain in the 2011 and 2013 ALADINO: a cross-sectional study.	Survey of children's health behaviour, screen time, weekly consumption of select food groups, frequency of consumption, sleep patterns.	Screen viewing time, sleep duration, dietary patterns	Parents' higher education level associated with child's longer sleep duration, better diet quality and lower screen viewing time.
Rey-López et al 2011, Belgium, Greece, Hungary, Spain (24).	Food and drink intake during television viewing in adolescents: the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study	Survey of adolescents' dietary behaviour during TV watching, including time and type of food consumed.	TV viewing time, consumption of energy dense foods and beverages.	Adolescents from low-SES families are more likely to consume unhealthy drinks while watching TV (stronger effect for girls than boys).
Tatlow-Golden M et al 2014, Ireland, UK (25).	Young children's food brand knowledge. Early development and associations with television viewing and parent's diet.	Brand recognition and knowledge among children 3-5 years, parents' reported health behaviour of children.	Dietary patterns, TV viewing, brand name, product type and logo recognition.	Brand knowledge of unhealthy (but not healthy) products was positively related to their TV viewing, and their consumption of unhealthy products. Greater brand knowledge in children from families with lower mothers' education.



Funded by the Horizon 2020
Framework Programme
of the European Union
GA: 774548



Author, date, country	Title	Summary of methods	Impact measures	SES-differentiated results
Thomas et al 2019, UK (26).	Area deprivation, screen time and consumption of food and drink high in fat salt and sugar (HFSS) in young people: results from a cross-sectional study in the UK.	Online self-reported survey of diets, health knowledge and viewing time of commercial TV channels.	Food diary, TV channel viewing, health knowledge. SES indicated by geographical area deprivation metrics	Young people in more deprived areas more likely to consume HFSS products, report increased exposure to HFSS advertising and have a poorer awareness of health and overweight.
Vereecken et al 2006, 35 countries (HBSC), including 33 in WHO-EURO (27).	Television viewing behaviour and associations with food habits in different countries.	Self-reported survey of TV viewing time and dietary patterns.	Food frequency questionnaire, reported TV viewing (with test-retest validation).	Higher viewing times among children of lower SES, and higher TV viewing associated with worse dietary intakes in most countries. SES by diet not analysed in this paper, but other HBSC reports show poorer diet quality associated with lower family affluence.

Table 4.5. GRADE quality ratings for included studies on marketing

Study	Study design	Risk of bias: • sample size • representativeness • attendance /drop-outs • control group • statistical tests	Imprecision and inconsistency across results	Indirectness, assumptions	Other considerations	Overall GRADE assessment of certainty
Aljawad et 2016 (14).	Survey of low-priced confectionery	Small sample, one city, five deprivation levels, no statistical tests.	No sampling errors shown. Small sample size, weak consistency.	Product availability assumed to affect consumption.	Cross-sectional study, no intervention, no controls.	Low: The true effect might be markedly different from the estimated effect due to assumptions about price and availability
Buijzen et al 2008 (15).	Food diary linked to TV advertising	234 households, bias towards higher educated parents,	No standard errors shown. Total viewing time not associated with advertising exposure (unexpected?).	Assumes consumption linked to weight gain.	Cross-sectional study, no intervention, no controls.	Moderate: The true effect might be close to the estimated effect, but problem generalising from small, biased sample.



Study	Study design	Risk of bias: • sample size • representativeness • attendance /drop-outs • control group • statistical tests	Imprecision and inconsistency across results	Indirectness, assumptions	Other considerations	Overall GRADE assessment of certainty
Cetateanu & Jones 2014 (16).	Geospatial survey of retailers, local area deprivation and overweight surveys.	6000+ area samples. Good representation and SES spread, relevant tests.	Standard errors and ranges shown. Results show weak relationships despite extensive working of data.	Assumes food availability affects consumption.	Cross sectional study, no intervention, no control.	Moderate: The true effect might be close to the estimated effect, but local availability does not equate to consumption.
Gatou et al 2016 (17).	Experimental study of food choices by children exposed to advertisements	183 children, crossover study, wide SES range, relevant tests.	Standard errors shown. No obvious inconsistencies. Exposure increased consumption. Weight and dental status linked to self-reported TV viewing time.	Assumes consumption linked to weight status.	Found obese children chose healthier products (unexpected?)	Moderate: The true effect might be close to the estimated effect, but risk of bias from small sample.
Gebremariam et al 2017 (18).	Survey of 5000+ children in 8 countries.	Large sample, multiple countries. Self-reported and parent-reported measures. Relevant tests.	Standard errors shown. Findings applied to some countries and not others.	TV viewing (not advertising exposure), soft drinks used as indicator of diet and health status.	Countries differed in proportion of parents with low education (19% to 60%).	Low: The true effect might be markedly different from the estimated effect due to differences in samples, and assumptions about impact of TV on weight status.
Giese H et al 2015 (19).	Survey of 2000+ children in 3 countries	Fair size sample, self-reported exposure, self-reported diets, unadjusted correlations.	No standard errors for correlations, but significance levels indicated. Findings applied to one country only.	Correlations significant but low (<0.25). Assumed influence of advertising on consumption.	Recall of advertisements for broad food categories.	Low: The true effect might be markedly different from the estimated effect due to differences in samples, and assumptions about impact of advertising on health behaviour.
Griffith et al 2019 (13).	Modelling a ban on TV marketing	UK representative 6000+ households with children, modelled exposure by time of	Standard errors and model sensitivity tests. Internally consistent	Assumes exposure leads to purchase,	Exposure data only.	High: The true effect is likely to be close to the estimated



Study	Study design	Risk of bias: • sample size • representativeness • attendance /drop-outs • control group • statistical tests	Imprecision and inconsistency across results	Indirectness, assumptions	Other considerations	Overall GRADE assessment of certainty
	of HFSS foods pre-9.00pm.	day, assessed different industry responses, and no response. Relevant tests.	across parental skill level, parental income quartile, deprivation index.	consumption, and health outcome.		effect, but there are weaknesses in generalisability.
Kapetanaki AB et al 2019 (20).	Survey of 200+ children in 7 schools.	Small numbers in each school (mean <20 of each gender), diet relied on online recall of purchases, and assumed consumption. Unusual statistical tests.	Bootstrapped confidence intervals from 5000 replications. Consistent lack of differential findings.	Assumes self-declared susceptibility leads to purchase, consumption and health.	Designed to test role of peer influence and advertising susceptibility	Low: The true effect might be markedly different from the estimated effect due to small samples, and self-reported information.
Kearney et al 2021 (21).	Experimental study of food choices by children exposed to advertisements	101 children, crossover study, majority lower SES, relevant tests. Possible contamination from uncontrolled food consumption before trial.	Standard errors for data, but no SES-differentiated data shown. Inconsistent with previous trials – authors expected an SES effect.	Assumes short-term effect of an advertisement translates into longer-term health behaviours.	(Children with dental caries had greater intake response to advertising.)	Moderate: The true effect might be close to the estimated effect, but the study only measures short-term effects.
Lissner et al 2012 (22).	Questionnaire of parents of younger children.	15,000+ children, 8 countries, wide range of educational levels of parents, relevant statistical tests (most adjusted out the SES variables).	Standard errors reported. No numerical results shown for effects by SES variable.	Assumes TV viewing influences dietary behaviour and health.	No measure of advertising exposure.	Moderate: The true effect might be close to the estimated effect, but the study does not measure advertising exposure.
Pérez-Farinós et al 2017 (23).	Questionnaire of children aged 6-9 years.	9000+ children (WHO COSI samples), likely representative, relevant tests.	Large sample. Standard errors reported. Relation of SES to outcome variable listed but not cross-tabulated for interactions.	Assumes viewing time affects weight gain, but no anthropometry reported.		Moderate: The true effect might be close to the estimated effect, but SES was not cross-tabulated against diet and screen viewing simultaneously.
Rey-López et al 2011 (24).	Questionnaire of adolescents	1300+ children, (200-400 in each country),	Confidence intervals reported. Consistent	Influence of advertising not		Moderate: The true effect might be close to the estimated



Study	Study design	Risk of bias: <ul style="list-style-type: none"> • sample size • representativeness • attendance /drop-outs • control group • statistical tests 	Imprecision and inconsistency across results	Indirectness, assumptions	Other considerations	Overall GRADE assessment of certainty
		representativeness not clear, tests of odds ratios.	with previous HELENA study (more TV viewing in lower-SES families).	assessed. No anthropometry reported.		effect, but SES was not cross-tabulated against diet and screen viewing simultaneously.
Tatlow-Golden M et al 2014 (25).	Parental questionnaire and child brand-recognition tests	172 children, diverse SES households, used healthy and unhealthy brands' logos, relevant statistics.	Standard errors reported. Results for brand name, logo and product type internally consistent.	Brand recognition associated with TV viewing time.	SES by TV viewing and diet consistent with other studies.	High: The true effect is likely be close to the estimated effect, but the sample was small.
Thomas et al 2019 (26).	Questionnaire of adolescents' (11-19 years) health behaviours.	3000+ children, distributed across deprivation areas, relevant statistics.	Confidence intervals reported. TV and diet consistent with other studies.	Indirect measures of SES. Indirect measure of HFSS advertisement exposure.		High: The true effect is likely be close to the estimated effect, but measures were indirect.
Vereecken et al 2006 (27).	Questionnaire of health behaviours of adolescents (11-15 years).	160,000+ children, relevant statistics but no SES differentiation of diets analysed here.	Standard errors shown. Consistent with other studies.	TV viewing, not advertising exposure. Diet not analysed by SES.	No anthropometric measures.	Moderate: The true effect might be close to the estimated effect, but SES was not cross-tabulated against diet and screen viewing simultaneously, and there was some variation by country sample.

Table 4.6. Summary of results and policy implications for marketing restrictions to reduce SES health inequalities

Study	Summary of SES-differentiated results	GRADE assessment	Policy implication to reduce health inequalities
Aljawad et al 2016 (14).	Greater promotion of low-cost confectionery in lower income areas.	Low	Redirect retail promotions towards healthier products.
Buijzen et al 2008 (15).	Association between television advertising and consumption of unhealthy and total food is higher for children in lower-income families.	Moderate	Reduce exposure to television advertising (quantity and quality).
Cetateanu & Jones 2014 (16).	Unhealthy food in local shops does not explain association of bodyweight to area deprivation.	Moderate	None (simple availability of unhealthy products is not a driver of overweight disparities).
Gatou et al 2016 (17).	Equal advertising exposure affects children's consumption equally across SES.	Moderate	Reduce differential exposure, as all children are susceptible.
Gebremariam et al 2017 (18).	Evidence in two countries shows TV viewing associated with more soft drink consumption in families with lower-educated parents.	Low	Reduce exposure for greater impact in lower SES families.
Giese H et al 2015 (19).	Evidence in one country of children's higher exposure to unhealthy advertisements, and higher unhealthy food consumption, in lower SES families.	Low	Reduce exposure for greater impact in lower SES families.
Griffith et al 2019 (13).	Modelling of impact of TV advertising restrictions shows reduced exposure and greater benefit for lower-income households.	Moderate	Reduce exposure for greater impact in lower SES families.
Kapetanaki AB et al 2019 (20).	Self-reported susceptibility to advertising shows no differences in food consumption across SES variables.	Low	Reduce differential exposure, as all children are susceptible.
Kearney et al 2021 (21).	Equal exposure to snack advertising shows same effect on children's consumption across SES level.	Moderate	Reduce differential exposure, as all children are susceptible.
Lissner et al 2012 (22).	Higher parental education linked to reduced TV viewing.	Moderate	Reduce exposure for greater impact in lower SES families.
Pérez-Farinós et al 2017 (23).	Higher parental education linked to reduced TV viewing, better sleep patterns and better diet.	Moderate	Reduce exposure for greater impact in lower SES families.
Rey-López et al 2011 (24).	Adolescents from low-SES families are more likely to consume unhealthy drinks while watching TV.	Moderate	Reduce exposure and improve eating patterns for greater impact in lower SES families.
Tatlow-Golden M et al 2014 (25).	Lower maternal education linked to children's greater TV viewing, greater brand awareness for unhealthy products, and unhealthy food consumption.	High	Reduce exposure for greater impact in lower SES families.
Thomas et al 2019 (26).	Young people in more deprived areas report greater exposure to HFSS advertising, are more likely to consume unhealthy products, and have a poorer awareness of health and overweight.	High	Reduce exposure and improve eating patterns for greater impact in lower SES families.
Vereecken et al 2006 (27).	Children of lower SES have higher TV viewing and TV viewing is linked to worse dietary intakes in most countries.	Moderate	Reduce exposure for greater impact in lower SES families.

29 Evidence gaps

Following good practice, an analysis of gaps in the evidence was included in the Methods for this report. It can be seen from the results shown above that the evidence available from studies of three

policy areas concerning European children differentiated by socio-economic measures is extremely limited. As shown in the table below (Table 4.7), there are no systematic reviews or meta-analyses directly applicable to any of the three policy areas. However, there are systematic reviews that include non-European studies, and we comment on this in the Discussion (Section 5 below).

Table 4.7. Types of study on child-related SES disparities in Europe.

	Health-related food and beverage taxes	Front-of-pack nutrition labelling	Marketing restrictions
Controlled experimental studies	0	0	2 (17, 21)
Self-reported and parental-reported survey studies	0	0	10 (15, 18, 19, 20, 22, 23, 24, 25, 26, 27)
Geographical mapping studies	0	0	2 (14, 16)
Modelling	1 (12)	0	1 (13)
Systematic reviews	0	0	0
Meta-analyses	0	0	0

The Methods section also anticipated an analysis of the evidence available concerning specific policy-related questions: including comparisons between labelling formats, taxation approaches, advertising media and nutrient profiling schemes. There was very little evidence on these issues in relation to socio-economically differentiated effects. Two papers (Griffith (13), Thomas (26)) used one form of nutrient profiling scheme developed as a policy in the UK (the Ofcom HFSS scheme) but did not compare this with other schemes. The Griffith paper also compared a modelled policy (restriction on HFSS TV advertising before 9pm) with the current UK policy (restriction on HFSS TV advertising in programming seen by a defined high proportion of children).

Table 4.8. Studies identified in Table 4.4 which compare specific aspects of policies relevant to policy formation

	Studies on children and inequalities related to specific policy aspects
Health-related food and beverage taxes: <i>comparison by types of products taxed</i>	0
Health-related food and beverage taxes: <i>comparison of format of tax (sales tax, production levy, product subsidy, etc)</i>	0
Front-of-pack nutrition labelling: <i>comparison of label formats</i>	0
Marketing platforms: <i>comparison of media platforms</i>	0
Marketing products: <i>comparison of nutrient profiling schemes</i>	0 (Two studies (13, 26) used definitions of unhealthy foods based on a recognised national scheme (the UK HFSS scheme) but did not compare these to other schemes.)



Marketing methods: <i>comparison of promotional formats</i> (e.g. cartoon, celebrity)	0
Marketing methods: <i>comparison of TV advertising schedules or audiences</i>	1 – This study (13) compared a ban on HFSS products promoted prior to 9pm vs UK current restrictions.



30 Discussion

As noted in the Introduction, in most countries in the European region the risk of childhood overweight and obesity is higher in households of lower socio-economic affluence. Policy-makers should consider whether potential interventions might widen or narrow the socio-economic difference in obesity risk. This present review asks what evidence is available for the potential impact of three policies as they may affect children in respect of socio-economic disparities: (i) health-related taxes of foods and beverages, (ii) front-of-pack nutrition labelling, and (iii) restrictions on the promotional marketing of specified foods and beverages.

For health-related taxes, the review finds only one study originating in the region that addresses the impact of such taxes on children in respect of socio-economic disparities. This is a modelling study with several weaknesses. It finds children in households of all income levels would show health improvements following a sugar-sweetened beverage tax (of 20%), with the greatest improvements among the lower income households.

In respect of front-of-pack labelling, the present report finds no studies assessing socio-economic differences in the impact of policies on children. In respect of promotional marketing, it finds fifteen studies with relevant information on exposure differentials but only one study directly addressing the potential impact of a policy to restrict exposure. The single study addressing policy impact is a modelling study assessing children's exposure to the TV promotion of foods and beverages high in fats, sugars and salt (HFSS), comparing the present UK regulations (which restrict promotions during programmes seen by an audience with a high proportion of young viewers) and a policy to restrict promotions during all programming on evening television prior to 9pm. The study finds that children in lower-income households would experience the greatest reductions in exposure to the promotional marketing of HFSS products. The health benefit is assumed to follow as a consequence of reduced product demand, reduced consumption and overall improved dietary patterns.

Of the remaining fourteen studies examined, thirteen indicate that a policy of reducing marketing would be expected to benefit children in lower SES categories to the same extent or a greater extent than those in higher SES categories, largely due to their current higher level of exposure. There is no clear evidence of greater susceptibility to advertising messages among children in lower SES households, but there may be less awareness of the benefits of healthy dietary patterns among these children.

The gaps analysis further demonstrated a lack of policy-relevant evidence. Only two papers compared policies: one comparing current taxation levels of sugar-sweetened beverages with a modelled impact of a 20% tax, and one comparing current UK restrictions on television advertising compared to a modelled impact of an extended restriction. There were no papers looking at other issues of concern, such as types of product subjected to a tax, different formats of tax (volumetric sales tax, ad valorem sales tax, industry levy etc), different front-of-pack labelling formats, different promotional marketing methods, different media platforms, or different nutrient profiling schemes.

31 Limitations

The present review attempted to find studies to assist policy-makers in the European region when designing interventions to prevent childhood obesity and improved children's nutritional health. It focused on three such policies, and on the issue of socio-economic disparities and the potential impact of policies on widening, or narrowing, health inequalities. As demonstrated, very few studies were found that could help policy-makers reach a clear conclusion.

Although the majority of the studies reported here were conducted in a single country, six studies (18, 19, 22, 24, 25, 27) surveyed multiple countries. They reported findings which were not consistent across all countries, showing variations that may be due to cultural or other influences, and which may alter the effectiveness of policies. This is an additional concern that needs more detailed analysis.

The present review limited its search for evidence to those studies conducted in the European region. Extending the search to studies conducted beyond the region may introduce further variation, and may only confuse the conclusions. However, in order to extend the value of the current report, a search was conducted for systematic reviews of the three policy areas which were not specific to Europe, and which included studies from outside the European region. Systematic reviews that met the PICO criteria shown in Table 3.1, but which included non-European studies, were searched for in the databases examined in the present review. Twelve reviews (health taxes 4, front-of-pack labelling 3, marketing restrictions 5) were identified which met the inclusion criteria. A study on fast food menu display labelling was also included for potential interest. The texts were examined and the results are summarised in Table 5.1 below.

Table 5.1. Systematic reviews including non-European studies of the impact of policies on children according to SES

Author year (reference)	Title	Main finding	Comment
Health-related taxes			
Powell and Chaloupka 2009 (28)	Food Prices and Obesity: Evidence and Policy Implications for Taxes and Subsidies.	<i>“... evidence suggests that small taxes or subsidies are not likely to produce significant changes in BMI or obesity prevalence but that nontrivial pricing interventions may have some measurable effects on Americans’ weight outcomes, particularly for children and adolescents, low-SES populations, and those most at risk for overweight.” (p229-230)</i>	Taxes need to be ‘non-trivial’ to reduce child overweight disparities.
Powell et al 2013 (29)	Assessing the potential effectiveness of food and beverage taxes and subsidies for improving public health: a systematic review of prices, demand and body weight outcomes.	<i>“Lower fruit and vegetable prices were generally found to be associated with lower body weight outcomes among both low-income children and adults, suggesting that subsidies that would reduce the cost of fruits and vegetables for lower socio-economic populations may be effective in reducing obesity.” (p110)</i>	Subsidies on healthier products can reduce child overweight disparities.
Olstad et al 2016 (30)	Can policy ameliorate socioeconomic inequities in obesity and obesity-related behaviours? A systematic review of the impact of universal policies on adults and children.	<i>“Fiscal measures had consistently neutral or positive impacts on inequities.” (p1214)</i>	Both taxes and subsidies (e.g. applied to school meals) can reduce child overweight disparities.
Backholer et al 2016 (31)	The impact of a tax on sugar-sweetened beverages according to socio-economic position: a systematic review of the evidence	<i>“[A] tax on SSB will deliver similar population weight benefits across socio-economic strata or greater benefits for lower SEP groups” (p3070)</i> The review includes modelling studies showing similar findings for children and adults.	Taxes are potentially able to reduce child overweight disparities.
Labelling			
Campos et al 2011 (32)	Nutrition labels on pre-packaged foods: a systematic review	<i>“...label use is notably lower among children, adolescents and older adults... Individuals with lower socio-economic status are also less likely to use nutrition labels...”</i> Labelling with interpretative symbols <i>“found to increase consumer ability to identify healthier food options and consumer attention in general.” (p1501-1502)</i>	Review undertaken prior to the stronger symbols and warnings used in Latin America.
Hersey et al 2013 (33)	Effects of front-of-package and shelf nutrition labeling systems on consumers	<i>“...the percentage of consumers who use these [FOP labelling] schemes may be influenced by the level of education efforts and/or the particular communication strategy. To improve the nation’s</i>	FOP labelling schemes should be supported with targeted messaging to ensure

Author year (reference)	Title	Main finding	Comment
		<i>health, education and communication efforts for FOP and shelf nutrition labeling systems should target consumers who are at high risk for developing obesity-related illnesses and who are less likely to use FOP and shelf nutrition labeling schemes, including consumers with low socioeconomic status, with high body mass indices, or with children living in their households” (p12)</i>	low SES families make use of the label information.
Sarink et al 2016 (34)	The impact of menu energy labelling across socioeconomic groups: A systematic review	<i>“Of the two studies that reported a positive benefit of menu energy labelling overall, both identified a greater effect on fast food purchases among consumers visiting stores in high compared to low SEP neighbourhoods.” (p74)</i>	Children are not specifically assessed, but fast food menu calorie labelling may increase SES disparities
Champagne et al 2020 (35)	Policy brief: Front-of-pack Labelling.	<i>“Some schemes are good at reaching consumers with different nutrition knowledge, education and socio-economic levels, while others are considerably more useful when the consumer already possesses a baseline level of nutrition knowledge.” (p7)</i>	Not child-specific, but the reviewers state the value of labelling schemes that do not need high literacy or numeracy.
Marketing			
Williams et al 2011 (36)	The role of food culture and marketing activity in health disparities	<i>“Some contemporary research, most focused on children, raises concerns about racial disparities in exposure to nutritionally poor food advertisements based on their prevalence and on racial/ethnic differences in media consumption.” (p384)</i>	Marketing restrictions may specifically benefit children in targeted ethnic groups (USA data)
Adeigbe et al 2014 (37)	Food and Beverage Marketing to Latinos: A Systematic Literature Review	<i>“...this analysis suggests that the food and beverage marketing environment for Latinos is less likely to promote healthy eating and more likely to encourage the consumption of low-nutrient, calorie-dense foods and beverages, especially for Latino children.” (p575)</i>	Marketing restrictions may specifically benefit children in targeted ethnic groups (USA data)
Velazquez et al 2017 (38)	Food and Beverage Marketing in Schools: A Review of the Evidence	<i>“More pervasive marketing exposure was found among secondary or high schools compared with elementary / middle schools and among schools with lower compared with higher socio-economic status.” (p1)</i>	Marketing restrictions may specifically benefit children in more highly exposed groups
Russell et al 2019 (39)	The effect of screen advertising on children's dietary intake: A systematic review and meta-analysis	<i>“Various studies found television food advertising to be associated with dietary intake but not necessarily body weight. In one study, the association between advertising exposure and dietary intake was only found for lower income families.” (p565)</i>	Marketing restrictions may reduce dietary intake, especially for adolescents in lower income families.
Backholer et al 2021 (40)	Differential exposure to, and potential impact of, unhealthy advertising to children by socio-economic and ethnic groups: A systematic review of the evidence	<i>“We found strong and consistent evidence that children from socio-economically disadvantaged and ethnic minority backgrounds are disproportionately exposed to advertising of unhealthy food and non-alcoholic beverages...” (p17-18) “...the association between television advertising and fast food consumption was weaker for children from middle and high SEP households, compared with children from low SEP households.” (p17)</i>	Restrictions designed to reduce exposure are likely to have greater impact among children in lower SES households.

The results of this additional search are summarised for each review in the final column of Table 5.1. For policies on food taxation, they suggest that taxation can contribute to reduced disparities in overweight prevalence, providing the level of taxation is high enough (and passed through to the retail price) to change purchasing behaviour. For policies on labelling there is an indication that front-of-pack nutrition panels (and restaurant menu information) tend to be used by more educated and higher income population groups, and that only the most easily understood signals would have the most impact on lower-educated populations, reducing the risk of widening health disparities. Lastly, for marketing restrictions, there is consistent support for restricting exposure as a means of reducing consumption, and this is most effective for lower socio-economic groups.

32 Data collected but not reported

In the present review a number of studies were potentially of value because they measured the variables of interest, but were excluded because they did not report relevant results for this review. Several studies conducted in Europe measured a relevant socio-economic variable (e.g. household income or parental education) and examined children's exposure or behaviour relevant to policy-making, but when reporting the results the authors adjusted the findings to eliminate the differences in socio-economic characteristics. Equally, several studies examined SES disparities and collected data on household composition with respect to numbers of children of different ages, but did not report the results using this information. Examples are shown in Table 5.2 below.

Table 5.2. Examples of studies with relevant variables not differentially reported

Author year (reference)	Title	Relevant variables collected	Comment
Health-related taxes			
Allais et al 2010 (41)	The effects of a fat tax on French households' purchases: a nutritional approach	Parental education, households with children (4 age groups)	Modelled impact on purchases and body weight, but cross-tabulation not reported
Nordstrom and Thunstrom 2011 (42)	Economic policies for healthier food intake: the impact on different household categories	Modelled impact using GfK panels and national household budget surveys	Modelling did not utilise available demographic variables.
Harkanen et al 2014 (43)	The welfare effects of health-based food tax policy	Education, income, children in household (in five age groups)	Modelling results are not analysed by children in household.
Royo-Bordonada et al 2019 (44)	Impact of an excise tax on the consumption of sugar-sweetened beverages in young people living in poorer neighbourhoods of Catalonia, Spain: a difference in differences study	Age (range 12-40y), household educational level, occupational status	Before-after impact of tax effects are not differentiated by age or SES.
Labelling			
Balcombe et al 2010 (45)	Traffic lights and food choice: A choice experiment examining the relationship between nutritional food labels and price	Household income, parental occupation, education, number of children	Food choices are influenced by Front-of-pack labels, reported by education and by children in household, but not both.
Moser et al 2010 (46)	Simplified nutrient labelling: consumers' perceptions in Germany and Belgium	Household adults' education, households with and without children.	Results differentiated by adults' education, and with or without children, but not both.
Kocken et al 2012 (47)	Promoting the Purchase of Low-Calorie Foods From School Vending Machines: A Cluster-Randomized Controlled Study	Includes labelling intervention. Schools categorised as providing low (vocational) level of education, mixed, and	Results not differentiated by school type.



Author year (reference)	Title	Relevant variables collected	Comment
		high (preparation for higher education).	
Julia et al 2017 (48)	Perception of different formats of front-of-pack nutrition labels according to socio-demographic, lifestyle and dietary factors in a French population: cross-sectional study among the NutriNet-Santé cohort participants	Household income and adults' education, households with and without children.	Results differentiated by household income and education, and with or without children, but not both.
Marketing			
Aranceta et al 2003 (49)	Sociodemographic and lifestyle determinants of food patterns in Spanish children and adolescents: the enKid study	TV viewing, diet and mothers' educational level.	Diet patterns reported by TV watching and by mother's education, but not both.
Freisling et al 2009 (50)	Mass media nutrition information sources and associations with fruit and vegetable consumption among adolescents	Media use, diet and household income.	Media use and diet patterns reported, but only after adjusting for income.
Reisch et al 2013 (51)	Experimental Evidence on the Impact of Food Advertising on Children's Knowledge about and Preferences for Healthful Food	TV viewing, brand awareness, food knowledge, BMI and parental education level.	All results reported after adjusting for parental education.
Börnhorst et al 2015 (52)	WHO European Childhood Obesity Surveillance Initiative: associations between sleep duration, screen time and food consumption frequencies	TV viewing, diet and parents' educational level.	Diet patterns reported by TV watching after adjusting for parental education.

33 Conclusion

A review of the effectiveness of three population-wide policies is being undertaken by the World Health Organization, concerning the three themes of specific interest being investigated in STOP project Work Package 4, namely health-related taxation, front-of-pack nutrition signalling, and restrictions on promotional marketing of foods and beverages to children. In STOP Task 4.1 a systematic review of the contextual issues for these three policies – specifically relating to acceptability, cost and equity issues – was undertaken and submitted as STOP Deliverable 4.1.

In order to further support the Task 4.1 the STOP project has now undertaken two further systematic reviews, including the present one which specifically focuses on the effects of the three named policies on the potential to increase or reduce the socio-economic disparities in overweight and obesity in children. The present document is submitted as STOP Deliverable 4.1b.

This review found that, despite clear evidence of an association between family socio-economic status and the risk of excess weight among children, and despite detailed analyses of the social determinants of health inequalities in Europe (53) and how they should be addressed in obesity-prevention policies in the region (54), there is an extraordinary lack of evidence showing how policies may widen or narrow SES disparities in children's risk of obesity.

The present review found that both taxation and marketing restrictions should in principle assist in reducing disparities in obesity risk for children. Front-of-pack nutrition signalling is unlikely to narrow the gap and may widen it unless the design of the signalling is considered. Overall, the evidence available is sparse and of poor general quality.

The lack of robust evidence justifies additional work on this issue. Policy makers need an evidence base that can assist in choosing and refining the policies needed to tackle childhood obesity. There is increasing evidence that population-wide policies such as the three considered in the present review have been shown to be popular, feasible, and generally cost-effective (see STOP Deliverable 4.1), but if they widen health disparities then they may need to be re-considered or re-designed.

A checklist for policy makers concerned with health disparities and the effects of interventions for tackling overweight might include examining evidence for the following:

- levels of pre-determined risk (e.g. disparities due to ethnicity or early nutrition);
- vulnerability (e.g. disparities due to education and health awareness);
- exposure (e.g. disparities in food costs or labelling information, extent of screen viewing);
- additional or specific exposure due to socially targeted pricing or marketing;
- disparities in changes in exposure as a result of an intervention (e.g. price elasticities, changes in viewing preferences);
- disparities in consequential changes in health behaviour;
- disparities in the long-term maintenance of these behaviour changes.

Some of this information can be gathered from the evidence reviewed here, or could be gathered from the studies such as those noted above that have collected relevant data but not reported the results. A strong recommendation can be made to the agencies and departments that provide research funding that health disparities should be seen as a key element in the design and analysis of all studies of policy impacts, and that studies which have potential bearing on policy effectiveness should include reporting on the potential disparities in effectiveness across socio-economic groups.



34 References

1. Lobstein T, Neveux M, Landon J. Costs, equity and acceptability of three policies to prevent obesity: A narrative review to support policy development. *Obes Sci Pract.* 2020;**6**(5):562-583.
2. *Taking action on childhood obesity.* World Obesity Federation and World Health Organization. WHO/NMH/PND/ECHO/18.1. Geneva: WHO, 2018.
3. *Prevalence of overweight among children and adolescents.* WHO Global Health Observatory. Geneva: WHO, 2021. URL: <https://apps.who.int/gho/data/view.main.BMIPLUS1CREGv>, accessed 22 April 2021.
4. van Stralen MM, te Velde SJ, van Nassau F, Brug J, Grammatikaki E, Maes L, et al. Weight status of European preschool children and associations with family demographics and energy balance-related behaviours: a pooled analysis of six European studies. *Obes Rev.* 2012;**13** Suppl 1:29-41.
5. Brug J, van Stralen MM, Te Velde SJ, Chinapaw MJ, De Bourdeaudhuij I, Lien N, et al. Differences in weight status and energy-balance related behaviors among schoolchildren across Europe: the ENERGY-project. *PLoS One.* 2012;**7**(4):e34742.
6. World Health Organization Regional Office for Europe. *Differences in overweight and obese (IOTF), by FAS.* WHO European Health Information Gateway. Copenhagen: WHO, 2021. URL: https://gateway.euro.who.int/en/indicators/hbsc_120-differences-in-overweight-and-obese-iotf-by-fas/visualizations/#id=35541, accessed 22 April 2021.
7. Gebremariam MK, Lien N, Nianogo RA, Arah OA. Mediators of socioeconomic differences in adiposity among youth: a systematic review. *Obes Rev.* 2017;**18**(8):880-898.
8. *Taxes on sugary drinks: Why do it?* Geneva: World Health Organization, 2017.
9. *Guiding principles and framework manual for front-of-pack labelling for promoting healthy diets.* Geneva: World Health Organization, 2019.
10. *Set of recommendations on the marketing of foods and non-alcoholic beverages to children.* Geneva: World Health Organization, 2010.
11. Guyatt GH, Oxman AD, Vist G, Kunz R, Falck-Ytter Y, Alonso-Coello P, Schünemann HJ, GRADE Working Group: Rating quality of evidence and strength of recommendations GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ.* 2008;**336**: 924-926.
12. Schwendicke F, Stolpe M. Taxing sugar-sweetened beverages: impact on overweight and obesity in Germany. *BMC Public Health.* 2017;**17**(1):88.
13. Griffith R, O'Connell M, Smith K, Stroud R. *The potential impacts of banning television advertising of HFSS food and drink before the watershed.* London: Institute of Fiscal Studies, 2019.
14. Aljawad A, Morgan MZ, Rees JS, Fairchild R. The availability of novelty sweets within high school localities. *Br Dent J.* 2016;**220**(11):575-9.
15. Buijzen M, Schuurman J, Bomhof E. Associations between children's television advertising exposure and their food consumption patterns: a household diary-survey study. *Appetite.* 2008;**50**(2-3):231-9.
16. Cetateanu A, Jones A. Understanding the relationship between food environments, deprivation and childhood overweight and obesity: evidence from a cross sectional England-wide study. *Health Place.* 2014;**27**(100):68-76.
17. Gatou T, Mamai-Homata E, Koletsis-Kounari H, Polychronopoulou A. The short-term effects of television advertisements of cariogenic foods on children's dietary choices. *Int Dent J.* 2016;**66**(5):287-94.
18. Gebremariam MK, Chinapaw MJ, Bringolf-Isler B, Bere E, Kovacs E, Verloigne M, et al. Screen-based sedentary time: Association with soft drink consumption and the moderating effect of parental education in European children: The ENERGY study. *PLoS One.* 2017;**12**(2):e0171537.
19. Giese H, König LM, Täut D, Ollila H, Băban A, Absetz P et al. Exploring the association between television advertising of healthy and unhealthy foods, self-control, and food intake in three European countries. *App Psychol Health Well Being.* 2015;**7**(1):41-62.



20. Kapetanaki AB, Wills WJ, Danesi G, Spencer NH. Socioeconomic Differences and the Potential Role of Tribes in Young People's Food and Drink Purchasing Outside School at Lunchtime. *Int J Environ Res Public Health*. 2019;**16**(14):2447.
21. Kearney J, Fitzgerald R, Burnside G, Higham S, Flannigan N, Halford JCG, Boyland EJ. Television advertisements for high-sugar foods and beverages: effect on children's snack food intake. *Br J Nutr*. 2021;**125**(5):591-597.
22. Lissner L, Lanfer A, Gwozdz W, Olafsdottir S, Eiben G, Moreno LA, et al. Television habits in relation to overweight, diet and taste preferences in European children: the IDEFICS study. *Eur J Epidemiol*. 2012;**27**(9):705-15.
23. Pérez-Farinós N, Villar-Villalba C, López Sobaler AM, Dal Re Saavedra MÁ, Aparicio A, et al. The relationship between hours of sleep, screen time and frequency of food and drink consumption in Spain in the 2011 and 2013 ALADINO: a cross-sectional study. *BMC Public Health*. 2017;**17**(1):33
24. Rey-López JP, Vicente-Rodríguez G, Répásy J, Mesana MI, Ruiz JR, Ortega FB et al. Food and drink intake during television viewing in adolescents: the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study. *Public Health Nutr*. 2011;**14**(9):1563-9.
25. Tatlow-Golden M, Hennessy E, Dean M, Hollywood L. Young children's food brand knowledge. Early development and associations with television viewing and parent's diet. *Appetite*. 2014;**80**:197-203.
26. Thomas F, Thomas C, Hooper L, Rosenberg G, Vohra J, Bauld L. Area deprivation, screen time and consumption of food and drink high in fat salt and sugar (HFSS) in young people: results from a cross-sectional study in the UK. *BMJ Open*. 2019;**9**(6):e027333.
27. Vereecken CA, Todd J, Roberts C, Mulvihill C, Maes L. Television viewing behaviour and associations with food habits in different countries. *Public Health Nutr*. 2006;**9**(2):244-50.
28. Powell LM, Chaloupka FJ. Food prices and obesity: evidence and policy implications for taxes and subsidies. *Milbank Q*. 2009;**87**(1):229-57.
29. Powell LM, Chriqui JF, Khan T, Wada R, Chaloupka FJ. Assessing the potential effectiveness of food and beverage taxes and subsidies for improving public health: a systematic review of prices, demand and body weight outcomes. *Obes Rev*. 2013;**14**(2):110-28.
30. Olstad DL, Teychenne M, Minaker LM, Taber DR, Raine KD, Nykiforuk CI, Ball K. Can policy ameliorate socioeconomic inequities in obesity and obesity-related behaviours? A systematic review of the impact of universal policies on adults and children. *Obes Rev*. 2016;**17**(12):1198-1217.
31. Backholer K, Sarink D, Beauchamp A, Keating C, Loh V, Ball K et al. The impact of a tax on sugar-sweetened beverages according to socio-economic position: a systematic review of the evidence. *Public Health Nutr*. 2016;**19**(17):3070-3084.
32. Campos S, Doxey J, Hammond D. Nutrition labels on pre-packaged foods: a systematic review. *Public Health Nutr*. 2011;**14**(8):1496-506.
33. Hersey JC, Wohlgenant KC, Arsenault JE, Kosa KM, Muth MK. Effects of front-of-package and shelf nutrition labeling systems on consumers. *Nutr Rev*. 2013;**71**(1):1-14.
34. Sarink D, Peeters A, Freak-Poli R, Beauchamp A, Woods J, Ball K, Backholer K. The impact of menu energy labelling across socioeconomic groups: A systematic review. *Appetite*. 2016;**99**:59-75.
35. Champagne B, Arora M, El Sayed A, Logstrup S, Naidoo P Shilton T et al. *Policy Brief: Front-of-Pack Labelling*. Geneva: World Heart Federation, 2020.
36. Williams JD, Crockett D, Harrison RL, Thomas KD. The role of food culture and marketing activity in health disparities. *Prev Med*. 2012;**55**(5):382-6.
37. Adeigbe RT, Baldwin S, Gallion K, Grier S, Ramirez AG. Food and Beverage Marketing to Latinos: A Systematic Literature Review. *Health Educ Behav*. 2015;**42**(5):569-82.
38. Velazquez CE, Black JL, Potvin Kent M. Food and Beverage Marketing in Schools: A Review of the Evidence. *Int J Environ Res Public Health*. 2017 **12**;14(9):1054.
39. Russell SJ, Croker H, Viner RM. The effect of screen advertising on children's dietary intake: A systematic review and meta-analysis. *Obes Rev*. 2019;**20**(4):554-568.



40. Backholer K, Gupta A, Zorbas C, Bennett R, Huse O, Chung A et al. Differential exposure to, and potential impact of, unhealthy advertising to children by socio-economic and ethnic groups: A systematic review of the evidence. *Obes Rev.* 2021;**22**(3):e13144.
41. Allais O, Bertail P, Nichele V. The effects of a fat tax on French households' purchases: a nutritional approach. *Amer. J. Agr. Econ.* 2010;**92**(1): 228–245;
42. Nordström J, Thunström L. Economic policies for healthier food intake: the impact on different household categories. *Eur J Health Econ.* 2011;**12**(2):127-40.
43. Härkänen T, Kotakorpi K, Pietinena P, Pirttilä J, Reinivuo H, Suoniemi I. The welfare effects of health-based food tax policy. *Food Policy* 2014;**49**:196–206.
44. Royo-Bordonada MÁ, Fernández-Escobar C, Simón L, Sanz-Barbero B, Padilla J. Impact of an excise tax on the consumption of sugar-sweetened beverages in young people living in poorer neighbourhoods of Catalonia, Spain: a difference in differences study. *BMC Public Health.* 2019;**19**(1):1553.
45. Balcombe K, Fraser I, Di Falco S. Traffic lights and food choice: A choice experiment examining the relationship between nutritional food labels and price. *Food Policy* 2010;**35**:211–220
46. Moser A, Hoefkens C, Van Camp J, Verbeke W. Simplified nutrient labelling: consumers' perceptions in Germany and Belgium. *Journal of Consumer Protection and Food Safety (J. Verbr. Lebensm)* 2010;**5**:169–180.
47. Kocken PL, Eeuwijk J, Van Kesteren NM, Dusseldorp E, Buijs G, Bassa-Dafesh Z, Snel J. Promoting the purchase of low-calorie foods from school vending machines: a cluster-randomized controlled study. *J Sch Health.* 2012;**82**(3):115-22.
48. Julia C, Péneau S, Buscail C, Gonzalez R, Touvier M, Hercberg S, Kesse-Guyot E. Perception of different formats of front-of-pack nutrition labels according to sociodemographic, lifestyle and dietary factors in a French population: cross-sectional study among the NutriNet-Santé cohort participants. *BMJ Open.* 2017;**7**(6):e016108.
49. Aranceta J, Pérez-Rodrigo C, Ribas L, Serra-Majem L. Sociodemographic and lifestyle determinants of food patterns in Spanish children and adolescents: the enKid study. *Eur J Clin Nutr.* 2003;**57** Suppl 1:S40-4.
50. Freisling H, Haas K, Elmadfa I. Mass media nutrition information sources and associations with fruit and vegetable consumption among adolescents. *Public Health Nutr.* 2010;**13**(2):269-75.
51. Reisch LA, Gwozdz W, Barba G, De Henauw S, Lascorz N, Pigeot I. Experimental evidence on the impact of food advertising on children's knowledge about and preferences for healthful food. *J Obes.* 2013;**2013**:408582. (See also Corrigendum *J Obes.* 2017;**2017**:2826763.)
52. Börnhorst C, Wijnhoven TM, Kunešová M, Yngve A, Rito AI, Lissner L et al. WHO European Childhood Obesity Surveillance Initiative: associations between sleep duration, screen time and food consumption frequencies. *BMC Public Health.* 2015;**15**:442.
53. Marmot M, UCL Institute of Health Equity. *Review of social determinants and the health divide in the WHO European Region: final report.* Copenhagen, World Health Organization Regional Office for Europe, 2013 (updated 2014).
54. Loring B, Robertson A. *Obesity and inequities. Guidance for addressing inequities in overweight and obesity.* Copenhagen, World Health Organization Regional Office for Europe, 2014.

35 Annex

Search strategies

Search terms for the databases (and number of papers returned) are shown below.

OVID / Medline (PubMed)

Medline definitions

Food	"food"[MeSH Terms] OR "food"[All Fields]
Beverages	"beverages"[MeSH Terms] OR "beverages"[All Fields]
Child	"child"[MeSH Terms] OR "child"[all fields] OR child+[Text Word] OR children[Text Word]
Socio-economic	"socioeconomic factors"[MeSH Terms] OR ("socioeconomic"[All Fields] AND "factors"[All Fields]) OR "socioeconomic factors"[All Fields] OR "inequality"[All Fields] OR disparity[All Fields] OR ("education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]) OR deprivation[All Fields]
Education	"education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]
Literacy	"literacy"[MeSH Terms] OR "literacy"[All Fields]
Advertising and marketing	"marketing"[MeSH Terms] OR "marketing"[All Fields] OR ("advertising as topic"[MeSH Terms] OR ("advertising"[All Fields] AND "topic"[All Fields]) OR "advertising as topic"[All Fields] OR "advertising"[All Fields]) OR commercials[All Fields]
Nutrition	"nutritional status"[MeSH Terms] OR ("nutritional"[All Fields] AND "status"[All Fields]) OR "nutritional status"[All Fields] OR "nutrition"[All Fields] OR "nutritional sciences"[MeSH Terms] OR ("nutritional"[All Fields] AND "sciences"[All Fields]) OR "nutritional sciences"[All Fields]
Labelling	"food labeling"[MeSH Terms] OR ("food"[All Fields] AND "labeling"[All Fields]) OR "food labeling"[All Fields] OR ("nutrition"[All Fields] AND "label"[All Fields]) OR "nutrition label"[All Fields]

Fiscal measures (176 results)

(fiscal[All Fields] OR tax[All Fields] OR ("taxes"[MeSH Terms] OR "taxes"[All Fields] OR "taxation"[All Fields]))

AND (((("food"[MeSH Terms] OR "food"[All Fields]) OR ("beverages"[MeSH Terms] OR "beverages"[All Fields])))

AND (("socioeconomic factors"[MeSH Terms] OR ("socioeconomic"[All Fields] AND "factors"[All Fields]) OR "socioeconomic factors"[All Fields] OR "inequality"[All Fields]) OR disparity[All Fields] OR ("education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]) OR deprivation[All Fields]))

AND ("child"[MeSH Terms] OR "child"[all fields])



Labelling (358 results)

("food labeling"[MeSH Terms] OR ("food"[All Fields] AND "labeling"[All Fields]) OR "food labeling"[All Fields] OR ("nutrition"[All Fields] AND "label"[All Fields]) OR "nutrition label"[All Fields])

AND (((("food"[MeSH Terms] OR "food"[All Fields]) OR ("beverages"[MeSH Terms] OR "beverages"[All Fields]))

AND (("socioeconomic factors"[MeSH Terms] OR ("socioeconomic"[All Fields] AND "factors"[All Fields]) OR "socioeconomic factors"[All Fields] OR "inequality"[All Fields]) OR disparity[All Fields] OR ("education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]) OR socio-economic[All Fields] OR ("literacy"[MeSH Terms] OR "literacy"[All Fields]) OR deprivation[All Fields]))

AND ("child"[MeSH Terms] OR "child"[all fields])

Marketing (977 results)

((("marketing"[MeSH Terms] OR "marketing"[All Fields]) OR ("advertising as topic"[MeSH Terms] OR ("advertising"[All Fields] AND "topic"[All Fields]) OR "advertising as topic"[All Fields] OR "advertising"[All Fields]) OR commercials[All Fields])

AND (("food"[MeSH Terms] OR "food"[All Fields]) OR ("beverages"[MeSH Terms] OR "beverages"[All Fields]))

AND (("socioeconomic factors"[MeSH Terms] OR ("socioeconomic"[All Fields] AND "factors"[All Fields]) OR "socioeconomic factors"[All Fields] OR "inequality"[All Fields]) OR disparity[All Fields] OR ("education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]) OR socio-economic[All Fields] OR ("literacy"[MeSH Terms] OR "literacy"[All Fields]) OR deprivation[All Fields])

AND ("child"[MeSH Terms] OR "child"[all fields])

Web of Science

Fiscal (40 results)

# 13	34,952	TS=fiscal
# 14	91,649	TS=tax
# 15	119,108	#13 OR #14
# 16	908,374	TS=food
# 17	45,789	TS=beverage
# 18	933,728	#16 OR #17
# 19	2,766	#15 AND #18
# 20	1,713,295	TS=child
# 21	347	#19 AND #20
# 22	125,091	TS=disparity
# 23	247,898	TS=inequality
# 24	73,038	TS=socio-economic
# 25	429,056	#22 OR #23 OR #24
# 26	40	#21 AND #25

Marketing (139 results)

# 27	2,528	#18 AND #20 AND #25
# 28	45,789	TS=advertising
# 29	777,750	TS=marketing
# 30	811,494	#28 OR #29
# 31	139	#27 AND #30

Labelling (40 results)

# 32	669,548	TS=label*
# 33	40	#27 AND #32

SCOPUS

Labelling (12 results)

TITLE-ABS-KEY (child AND (socio-economic OR deprivation OR inequalities OR disparity) AND (food OR beverage) AND label+)

Fiscal measures (44 results)

TITLE-ABS-KEY (child AND (socio-economic OR deprivation OR inequalities OR disparity) AND (food OR beverage) AND (fiscal OR tax))

Marketing (116 results)

TITLE-ABS-KEY (child AND (socio-economic OR deprivation OR inequalities OR disparity) AND (food OR beverage) AND (market+ OR advertis+))

Cochrane Reviews and Cochrane CENTRAL trials



Marketing (3 trials, 79 reviews)

((marketing OR advertising) AND (child) AND (food OR beverages)) AND (inequality OR socio-economic OR disparity)

Fiscal (0 trials, 18 reviews)

((fiscal OR tax) AND (child) AND (food OR beverages)) AND (inequality OR socio-economic OR disparity)

Labelling (2 trials, 58 reviews)

((labelling) AND child) AND (food OR beverages)) AND (inequality OR socio-economic OR disparity)

Table of included studies

Health-related taxes	
Reference 12	Schwendicke F, Stolpe M. Taxing sugar-sweetened beverages: impact on overweight and obesity in Germany. <i>BMC Public Health</i> . 2017; 17 (1):88.
Front-of-pack labelling	
--	[no studies]
Exposure to promotional marketing	
14	Aljawad A, Morgan MZ, Rees JS, Fairchild R. The availability of novelty sweets within high school localities. <i>Br Dent J</i> . 2016; 220 (11):575-9.
15	Buijzen M, Schuurman J, Bomhof E. Associations between children's television advertising exposure and their food consumption patterns: a household diary-survey study. <i>Appetite</i> . 2008; 50 (2-3):231-9.
16	Cetateanu A, Jones A. Understanding the relationship between food environments, deprivation and childhood overweight and obesity: evidence from a cross sectional England-wide study. <i>Health Place</i> . 2014; 27 (100):68-76
17	Gatou T, Mamai-Homata E, Koletsi-Kounari H, Polychronopoulou A. The short-term effects of television advertisements of cariogenic foods on children's dietary choices. <i>Int Dent J</i> . 2016; 66 (5):287-94.
18	Gebremariam MK, Chinapaw MJ, Bringolf-Isler B, Bere E, Kovacs E, Verloigne M, et al. Screen-based sedentary time: Association with soft drink consumption and the moderating effect of parental education in European children: The ENERGY study. <i>PLoS One</i> . 2017; 12 (2):e0171537.
19	Giese H, König LM, Täut D, Ollila H, Băban A, Absetz P et al. Exploring the association between television advertising of healthy and unhealthy foods, self-control, and food intake in three European countries. <i>Appl Psychol Health Well Being</i> . 2015; 7 (1):41-62.
13	Griffith R, O'Connell M, Smith K, Stroud R. <i>The potential impacts of banning television advertising of HFSS food and drink before the watershed</i> . London: Institute of Fiscal Studies, 2019.
20	Kapetanaki AB, Wills WJ, Danesi G, Spencer NH. Socioeconomic Differences and the Potential Role of Tribes in Young People's Food and Drink Purchasing Outside School at Lunchtime. <i>Int J Environ Res Public Health</i> . 2019; 16 (14):2447.
21	Kearney J, Fitzgerald R, Burnside G, Higham S, Flannigan N, Halford JCG, Boyland EJ. Television advertisements for high-sugar foods and beverages: effect on children's snack food intake. <i>Br J Nutr</i> . 2021; 125 (5):591-597.
22	Lissner L, Lanfer A, Gwozdz W, Olafsdottir S, Eiben G, Moreno LA, et al. Television habits in relation to overweight, diet and taste preferences in European children: the IDEFICS study. <i>Eur J Epidemiol</i> . 2012; 27 (9):705-15.
23	Pérez-Farinós N, Villar-Villalba C, López Sobaler AM, Dal Re Saavedra MÁ, Aparicio A, et al. The relationship between hours of



	sleep, screen time and frequency of food and drink consumption in Spain in the 2011 and 2013 ALADINO: a cross-sectional study. <i>BMC Public Health</i> . 2017; 17 (1):33
24	Rey-López JP, Vicente-Rodríguez G, Répásy J, Mesana MI, Ruiz JR, Ortega FB et al. Food and drink intake during television viewing in adolescents: the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study. <i>Public Health Nutr</i> . 2011; 14 (9):1563-9.
25	Tatlow-Golden M, Hennessy E, Dean M, Hollywood L. Young children's food brand knowledge. Early development and associations with television viewing and parent's diet. <i>Appetite</i> . 2014; 80 :197-203.
26	Thomas F, Thomas C, Hooper L, Rosenberg G, Vohra J, Bauld L. Area deprivation, screen time and consumption of food and drink high in fat salt and sugar (HFSS) in young people: results from a cross-sectional study in the UK. <i>BMJ Open</i> . 2019; 9 (6):e027333.
27	Vereecken CA, Todd J, Roberts C, Mulvihill C, Maes L. Television viewing behaviour and associations with food habits in different countries. <i>Public Health Nutr</i> . 2006; 9 (2):244-50.



36 Summary of Deliverable 4.1

Extracted from the Discussion and Conclusion of Deliverable 4.1.

Deliverable 4.1 Discussion

This review sets out to consider the three contextual factors: costs and cost-effectiveness, equity and social inequalities, and acceptability to stakeholders, in relation to three proposed policy options: health-related food taxes, FOP nutrition labelling, and restrictions to reduce children's exposure to and power of food and non-alcoholic beverage marketing.

The reviews undertaken here can at best be only indicative of the material available. As we have noted, the research material is sparse and uneven across the themes and policies. For example, estimating the costs and effectiveness of interventions has largely relied on modelling methods in a limited number of countries, and these have rarely been validated against actual policy interventions and their sustained effects over time.

Similarly, demonstration of inequities or social disparities arising from specific policies depends on factors such as differential exposure to the initial risk and to the intended intervention, differential responses and alternative response strategies. Sub-group cross-price elasticities may be significant in some contexts and not others, and may fluctuate under external influences such as promotional advertising campaigns, social marketing campaigns and media stories.

Even harder to review comprehensively is the acceptability of policies to stakeholders. Collating the variety and nuance of views across a range of interested parties even in a single member state is a significant research task and has been undertaken in only a few countries. The views and stated positions change over time, and are likely to be influenced by media stories or media personalities such as Jamie Oliver, as well as by the underlying beliefs and ideological positions held, on the relative importance of social determinants of behaviour or individual responsibility and freedom of choice.

Despite these caveats, some generalisations can be made and patterns of evidence described and summarised here:

Cost and cost-effectiveness

All three policy interventions have evidence in favour of being cost-effective, indeed cost-saving, when comparing estimates of the cost of implementing and maintaining an intervention against the health care savings predicted to accrue from the intervention. The health care savings are likely to be underestimates as not all health benefits are considered, nor the savings from reduced social care and increased economic productivity gained from improvements in population health. In the forthcoming OECD analysis of cost-effectiveness of policies for obesity, better food and menu labelling is anticipated to have a significant impact in the near term, while restrictions on marketing to children has the greatest impact long-term, providing \$6.6 saving for \$1 invested. Health-related food taxes are not assessed in the OECD study.

Equity and social disparities

Two case studies, Hungary and Mexico, provide the most substantial evidence of the impact of food taxes on different social groups by income or education levels. Both show a favourable effect, reducing consumption and reducing expenditure on the taxed foods and beverages.

The differential effects of front-of-pack food labelling are dependent on the format of the FOP nutritional information: those formats requiring least literacy or numeracy have greater impact on lower-educated or lower-income consumers. In addition, to the extent that FOP panels drive reformulation, all consumers benefit to the degree that they replace the original with the reformulated products in their diets.



Children's exposure to marketing may have a social gradient, though this is not necessarily the case in all countries as it depends on having easy access to the available media. Restrictions to marketing will benefit children in proportion to their initial exposure. Digital marketing channels are largely unexplored in terms of children's exposure differentiated across household income, parental education or ethnic group.

Stakeholder acceptability

A number of conclusions can be drawn from the evidence described here on stakeholder views. Stakeholders with commercial interest in the sale of HFSS foods can be expected to resist any forms of interference in their market activities, be it through raised prices, front-of-pack information, or restricted marketing.

In contrast, stakeholders concerned with health or consumer protection generally favour increased access to information on processed food packs (especially when these are easily understood) and to the protection of children from commercial inducements to unhealthy behaviour. Increased prices of snacks or sugar-sweetened beverages may meet public resistance, and should be mitigated with subsidies for healthier products or with guarantees that the revenue raised from the taxes will be used for socially valuable purposes – in the UK this was for school sports, in Hungary for public health services.

Deliverable 4.1 Conclusion

The WHO is undertaking systematic reviews of the effectiveness of policy actions to improve food environment in order to promote healthy diets, such as fiscal and pricing policies, nutrition labelling policies (including ingredient lists, nutrient declarations, nutrition claims, and front of pack labelling), and policies to restrict marketing to children. In forming policy guidelines for member states, the WHO also seeks to consider a number of contextual factors, as we have listed in the introduction, and to take these contextual factors into consideration when determining the strength of the policy guideline.

From the literature review undertaken here we make the following summary assessments:

Fiscal policies (health-related food taxes): *Highly cost-effective, moderately favourable for health equity, moderately supported by public (depending on the use of revenues), strongly supported by health professionals and NGOs, and moderately opposed by commercial interests.*

Front-of-pack nutritional labelling: *Highly cost-effective, moderately favourable for health equity (especially when not purely numerical), moderately supported by public, strongly supported by health professionals and NGOs (depending on the format) and moderately opposed by commercial interests (depending on the format).*

Front-of-pack red or black clear warnings: *Likely highly cost effective, likely highly favourable for health equity, likely moderately supported by public, highly supported by NGOs and health professionals, and highly opposed by commercial interests.*

Restriction of children's exposure to marketing: *Very highly cost-effective (in the longer term), moderately favourable for health equity, moderately supported by public, strongly supported by health professionals and NGOs, moderately opposed by commercial interests (unless voluntary).*

Based on these assessments, we believe that all three policy interventions merit adoption and promotion by international and national authorities.

D4.1: Evidence synthesis report (originally submitted M12, revised with annex)

37 D4.1 (originally submitted M12) Background

Excess bodyweight affects over a quarter of school-age pre-adolescents in Europe with several countries reporting prevalence levels above 40%.¹ Obesity prevention policies have been debated in most European member states as well as in leading intergovernmental institutions, including the Council of Europe, the World Health Organization (WHO), and the UN General Assembly, with increasing interest in population-wide interventions and market regulation, including fiscal measures.^{2,3}

In the EU-funded STOP project three policy interventions are identified for detailed research in Work Package (WP) 4. These are:

- fiscal policies (food and non-alcoholic beverages);
- regulation of food labelling;
- regulation of the marketing of food products to children

The WP includes as its first task a review of the available evidence concerning these policies. Task 4.1 of the STOP project states:

The work of WP4 will start with a systematic review and synthesis of the evidence available from studies that have assessed the effectiveness of policy options falling within the domain of this work package. [...] The focus of the systematic review in WP4 will be threefold, including fiscal policies (food and non-alcoholic beverages); regulation of food labelling; and regulation of the marketing of food products to children. In areas in which systematic reviews have been undertaken previously, STOP will update these reviews and compile “reviews of reviews”, as appropriate.

Variation of the task T4.1

After the award of the STOP grant it was learnt that the WHO was in the process of commissioning a number of systematic reviews of health-related policy interventions from leading experts as part of their guideline development process, and their commissions included systematic reviews of all three of the interventions described above for WP4, namely fiscal policies, nutrition labelling policies and policies to restrict marketing to children. The reviews were being undertaken in the latter half of 2018 and the year of 2019, and due to be presented to the WHO’s expert advisory group meeting in December 2019.

In consultation with the WHO it was considered that a better use of the STOP effort would be to supplement the systematic reviews commissioned by the WHO with a set of contextual reviews. In line with the WHO guideline development process, WHO uses the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach to assess the certainty of evidence and to develop recommendations. This also includes the GRADE evidence to decision (EtD) framework, which proposes consideration of factors that may affect the direction and strength of each recommendation. These factors are listed in the WHO *Handbook for Guideline Development, 2nd edition (2014)*.⁴

- Certainty of the evidence
- Values and preferences
- Balance of benefits and harms
- Resource implications
- Priority of the problem
- Equity and human rights
- Acceptability



- Feasibility

The reviews of these contextual issues related to the three policy interventions should be undertaken in a systematic manner, with a summary of the review findings presented in a narrative manner for each relevant factor. In selecting the factors to be examined in the present review we are making the following assumptions:

The factor '**Certainty of the evidence**' will be assessed in the main systematic reviews already commissioned through the use of GRADE and will be further discussed also by the expert advisory group at its meeting in December 2019.

The factor '**Values and preferences**' refers to the relative importance assigned to health outcomes by those affected by them, and for present purposes will be assumed to be rated 'high', as obesity and other chronic diseases consequential to dietary behaviour affect more than half the world's population.

The factor '**Priority of the problem**' has already been assessed by the WHO expert group when recommending the three policy reviews and is assumed to be 'high'.

The factor '**Balance of benefits and harms**' has not been researched systematically for the three policy areas but will be discussed in the present document where relevant material is found.

The factor '**Feasibility**' concerns a range of issues around cultural and legal frameworks, and political and financial opportunities and costs, and their generalisability across different national and cultural contexts. Given that several member states have already introduced actions under all three of the policy areas, it is possible to make an *a priori* assumption that feasibility is generally 'high'.

Therefore, it was decided to focus this review on the three remaining factors, '**Resource implications**', '**Equity and human rights**' and '**Acceptability**'.



38 Methods

The present review is a literature review to investigate the contextual factors ‘Resource implications’, ‘Equity and human rights’ and ‘Acceptability’ in relation to three types of policy intervention: Fiscal policies (food and non-alcoholic beverages); regulation of food labelling; regulation of the marketing of food products to children.

The three contextual factors are further clarified in the table below, adapted from the WHO *Handbook*.⁴

Table 1. Clarification of factors, defined in the WHO *Handbook*

Resource implications	This relates to how resource-intense an intervention is, whether it is cost-effective and whether it offers any incremental benefit. Resource implications can be informed by a formal economic evaluation based on estimates collected during evidence retrieval and by modelling of cost-benefit and cost-effectiveness. If a full evaluation is not possible, resource implications can be anticipated and described in a qualitative manner. The more advantageous or clearly disadvantageous the resource implications are, the greater the likelihood of a strong recommendation either for or against the intervention. A conditional recommendation is more likely to be issued if the resource implications are uncertain (if, for example, data on costs and how they vary across settings are not available, or if it has not been determined whether the net benefits of the intervention are worth the costs)
Equity and human rights	This relates to how the intervention (or the absence of an intervention) might affect equity and human rights, which is a necessary consideration when formulating recommendations in line with WHO’s core principles. The greater the likelihood that implementation of the intervention will reduce inequities or increase equity and the more the intervention has implications for progressive realization of the right to health, the greater the likelihood of a strong recommendation for the intervention.
Acceptability	Acceptability is affected by several factors, such as who benefits from an intervention and who is harmed by it; who pays for it or saves money on account of it; and when the benefits, harms and costs occur. Lack of acceptability may revolve around the distribution of the benefits, harms and costs of a given intervention; its undesirable short-term effects despite desirable long-term effects (benefits); or the ethical principles or judicial considerations involved. The greater the acceptability of an option to all or most stakeholders, the greater the likelihood of a strong recommendation for the intervention.

In order to clarify the literature review, we have constructed a PICO table for the three policy interventions.

Table 2: PICO framework and inclusion criteria for fiscal policies

PICO feature	Inclusion criteria
Population	General population



Intervention(s)	Interventions using taxes, levies, duties or tariffs for the purposes of influencing food choice and dietary behaviour. Includes foods and non-alcoholic beverages.
Comparison(s)	Modelled alternative interventions, before/after time series comparisons, no intervention.
Outcomes	Cost implications Equity and human rights Acceptability

Table 3: PICO framework and inclusion/exclusion criteria for front-of-pack food labelling

PICO feature	Inclusion/exclusion criteria
Population	General population
Intervention(s)	Interventions to provide information on the nutritional content of foods and non-alcoholic beverages on front panels of food packaging. Excludes nutrition or health claims. Excludes quantitative ingredient listing. Excludes non-front-of-pack nutrition information panels.
Comparison(s)	Modelled alternative interventions, before/after time series comparisons, no intervention.
Outcomes	Cost implications Equity and human rights Acceptability

Table 4: PICO framework and inclusion/ criteria for marketing to children

PICO feature	Inclusion criteria
Population	Children (defined by regulator or otherwise under 18 years)
Intervention(s)	Regulatory interventions to restrict the exposure of children to commercial messages for foods and non-alcoholic beverages, or to reduce the strength or impact of those messages.
Comparison(s)	Modelled alternative interventions, before/after time series comparisons, no intervention.
Outcomes	Cost implications Equity and human rights Acceptability

Search methods:

Literature searches were undertaken in Medline (PubMed) and the Cochrane Database for peer-reviewed literature, and through Google Scholar for additional peer-reviewed and grey literature and followed up with searches of government and intergovernmental agencies and non-governmental organisations and foundations, commercial associations and professional societies for additional grey literature. Search terms are shown in the Annex below. In brief they included

- (food OR beverages) AND (cost OR cost-benefit OR resource)
- (food OR beverages) AND (inequality OR disparity OR education OR socio-economic OR literacy)
- (food OR beverages) AND (acceptability OR stakeholder OR attitudes)



with the addition of relevant policy initiative terms

- (fiscal OR tax OR taxation)
- (nutrition AND labelling)
- (marketing OR advertising OR commercials) AND child).

Papers were restricted to English language available publications. For the Medline search, the results included both primary studies and reviews. The Medline and Cochrane searches included material from the database inception to the date of the search: June 4th-5th, 2019. For Google Scholar the first 100 results listed by relevance were examined for each of the three policy intervention searches. This search was conducted on June 13th, 2019. Data extraction followed a simple template supplied by the WHO and was undertaken by two researchers separately and cross checked in overlapped samples.



39 Results

The search of the Cochrane Database produced 17 review titles, of which 16 were rejected on title. The fourth concerning interventions to reduce the consumption of sugar-sweetened beverages (SSB) was accepted for data extraction.⁵

For the search of the Medline (PubMed) dataset, the three PRISMA charts below indicate the numbers of records returned from the searches for each of the three policy interventions, and the subsequent examination and filtering of these records to obtain papers for data extraction.

A fourth PRISMA chart below shows the records obtained from the Google Scholar search and the subsequent examination and filtering of these records to obtain papers for data extraction.

A total of 125 records were identified for data extraction:

- Fiscal interventions: n = 73
- Front-of-pack nutrition labelling interventions: n = 22
- Interventions to restrict marketing to children: n = 30

Deduplication reduced the total number, while analyses of the references in the selected literature led to further reports considered important to include in the present review. The searches of governmental, non-governmental and other sites produced a wide range of papers which were examined after the main data extraction exercise, in order to assess the scope of additional information they could provide. Over 100 documents were reviewed. In particular, the information on stakeholder views and acceptability was considerably enhanced, especially in official consultation responses, and future research efforts could be more intensively focused on this source of information.

In total, the numbers of documents used for data extraction and citation in the present report are as follows:

A total of 76 studies we identified for data extraction:

- Fiscal interventions: n = 47
- Front-of-pack nutrition labelling interventions: n = 12
- Interventions to restrict marketing to children: n = 17

Fig 1. PRISMA chart for Medline search for fiscal interventions

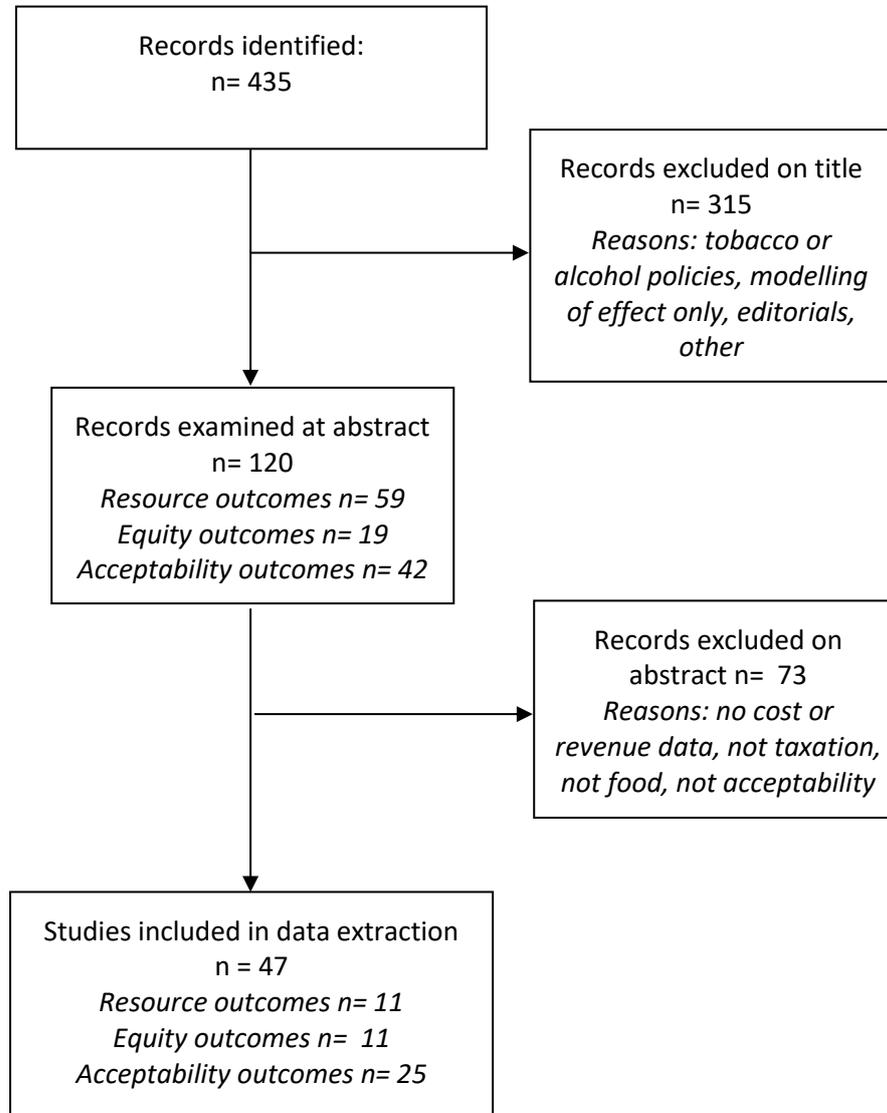


Fig 2. PRISMA chart for Medline search for front-of-pack nutrition labelling interventions

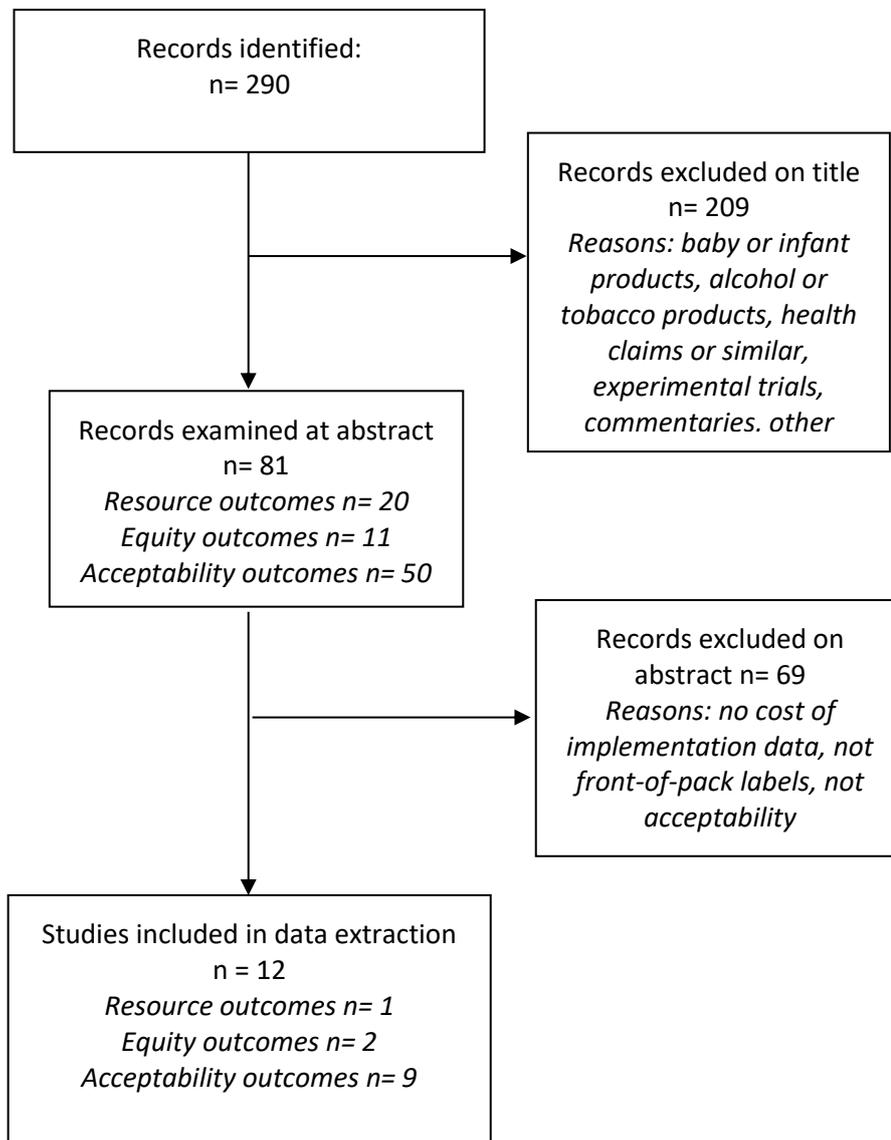


Fig 3. PRISMA chart for Medline search for interventions that restrict marketing to children

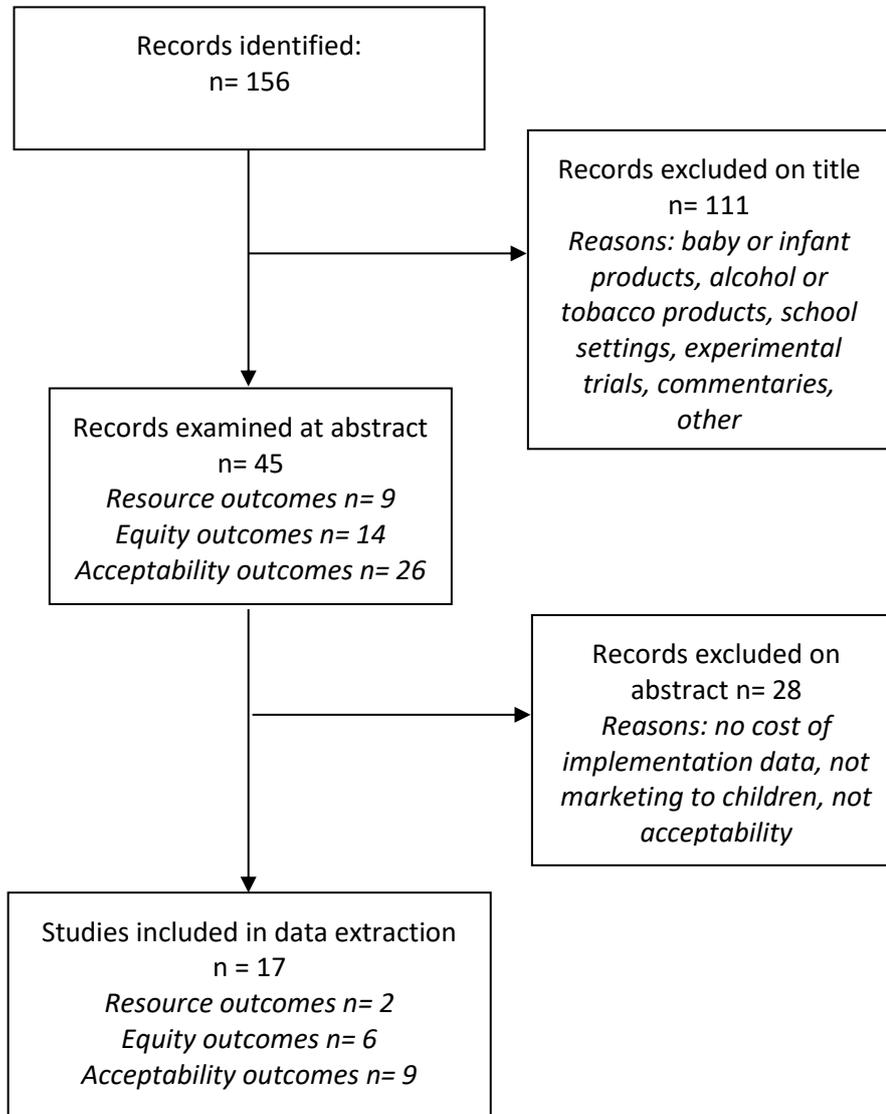
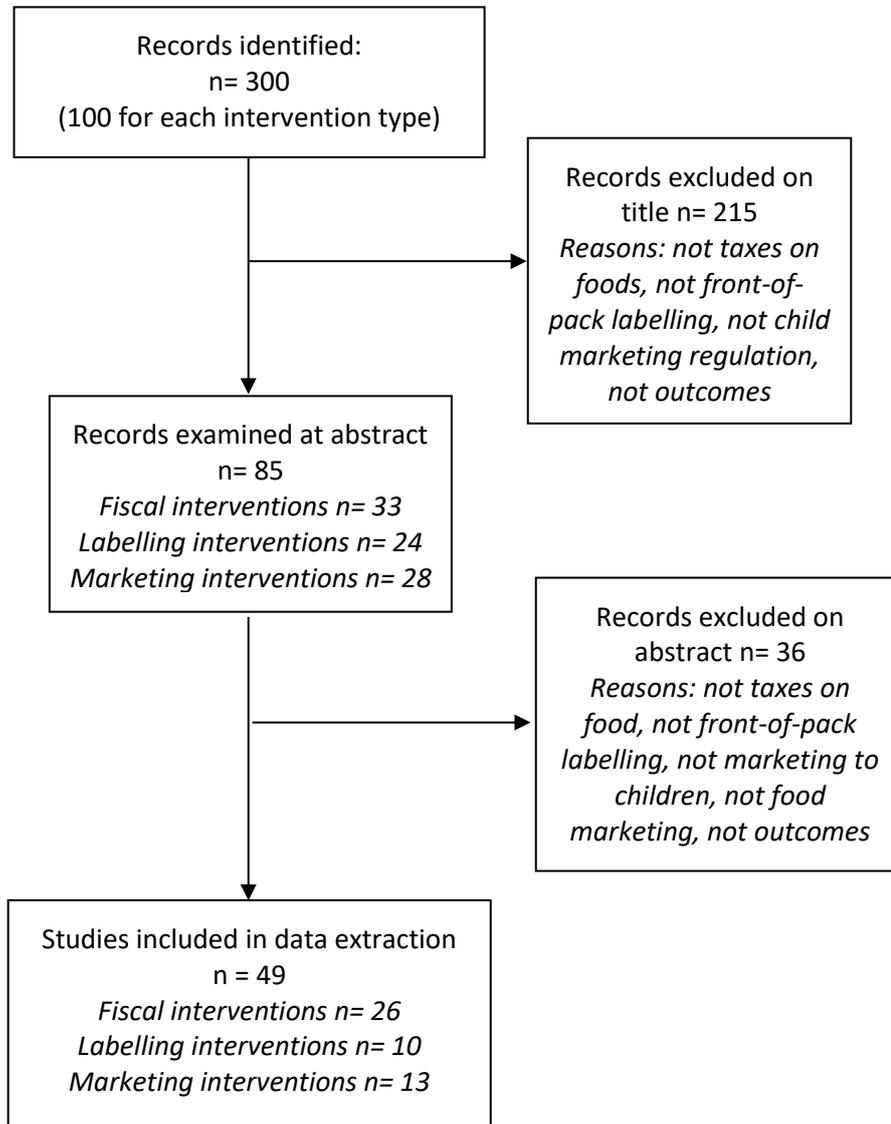


Fig 4. PRISMA chart for Google Scholar searches for all three interventions





The results are described here in three parts, for fiscal, labelling and marketing interventions. In each part, results are described for the three main factors under review: (i) costs and resources, (ii) equity and human rights, and (iii) acceptability for stakeholders.

40 Fiscal interventions

Costs, resources and revenues

Work by the Organization for Cooperation and Development (OECD) has indicated cost benefit advantages to be gained from 'fiscal measures that increase the price of unhealthy food content or reduce the cost of healthy foods rich in fibre' such as fruits and vegetables.⁶ The study was a general comparative modelling study using data from Brazil, China, India, Mexico, Russia, South Africa, and England. The assessment of the costs is described only sparsely as 'administration, training, mass media, and other activities', but the use of fiscal measures is endorsed as cost-effective. However, the costs to industry are highly dependent on the pass-through rate to consumers and the cost to consumers depends on the degree and type of substitution of products. A set of papers from the OECD is currently in press, and include estimates of the costs and benefits of policy interventions but does not appear to include fiscal measures among the policies examined.⁷

In July 2011, Hungary passed legislation to impose taxes applied on the salt, sugar and stimulant content of various categories of foods and beverages including sugar-sweetened drinks, energy drinks and pre-packaged sugar-sweetened products. Direct benefits of the tax hypothesized for the health services averaged around HUF 20bn per year for 2012, 2013 and 2014.⁸ Costs of implementation for the state are not available. Concerns that the tax might significantly reduce manufacturers' revenue and increase unemployment were addressed in a study of the Hungarian tax published by the WHO in 2013 which found that, of the 35 companies paying the most (over 80%) tax, net sales revenue and number of employees increased from 2010 to 2011, the years before and after introduction of the tax.⁹

Very few research papers make estimates of the costs of implementing health-related food taxes or subsidies, or of the resources that may be generated by the revenue from taxes. The 2009 ACE Obesity studies¹⁰ on cost-effective policies did not assess fiscal interventions, but an update from Sacks et al (2011)¹¹ modelled Australian data and estimated that a 'junk food' tax would cost \$AU18m annually after introduction, based on steady-state costs of administering the tax. This study used the WHO-CHOICE methods¹² for estimating cost-effectiveness of health policies. Long et al (2015)¹³ estimated that implementing an SSB excise tax in the USA would generate revenues of \$US 12.5bn annually (95% \$8.9bn - \$14.1bn) while its implementation cost would be \$US 51m in the first year, based on tax-collection agents' salaries and industry auditing and tax-reporting costs (see also Gortmaker 2015).¹⁴ A second Australian study, by Lal et al (2017),¹⁵ using similar assumptions to the US study from Long et al,¹³ estimated revenues from an SSB tax to be \$AU 0.65bn annually (95% \$0.35bn - \$1.17bn). The authors estimated intervention costs of \$AU5m in the first year and \$AU4m in subsequent years.

Media reports have suggested that the UK government's 2018 soft drinks industry levy on SSBs raised over £150m in the first six months of its implementation, which would be used to promote physical activity in primary schools.¹⁶ The SSB tax in Mexico is reported to have raised over \$1.2 bn in 2014.¹⁷



Few studies have been made of the costs to industry in lost sales of SSBs, or compensatory increases in low- or non-sugar beverage sales. A time-series study of the SSB tax in Berkeley, California,¹⁸ notes that for retailers there was little impact on overall sales: as sales of SSBs declined sales of non-taxed beverages increased, and consumer spending per transaction remained unaffected.

Two papers analysed the cost of imposing a health-related food tax in terms of impact on employment. Powell et al (2014)¹⁹ considered an SSB tax and used a macroeconomic simulation model taking account of reduced demand for beverages, increased tax revenues and effects on income levels, in California and Illinois. They found a net increase in employment, with declines in the industry offset by new employment in non-beverage industries and in government sectors. Guerrero-Lopez et al (2017)²⁰ used time-series data in the beverage and snack-food industries and in retail following the imposition of taxes in Mexico and found no significant change in employment in the relevant manufacturing industries, and a small increase in employment in retail stores. It might be argued on a priori grounds that employment levels are very low in a highly-automated production plant for ultra-processed beverages and snacks with long storage lives, compared with employment levels in less automated production for fresh and perishable foods, but we found no analyses to test this suggestion.

Evidence gaps

There are large gaps in the evidence base, as can be seen from the paucity of evidence described above. Cost-benefit analyses focus on benefits provided by reduced health care costs, and the estimates for these health care costs are usually restricted to the main noncommunicable diseases linked to diet (for example, the recent study by Lal et al (2017)¹⁵ considered nine disease outcomes likely to be affected by an SSB tax, but did not include dental disease, the most common sugar-related disease of all, or the treatment of obesity). Studies could be extended to include a wider range of conditions which are linked to dietary patterns. They could also include the wider societal costs that would be reduced if health improved, including work productivity and reduced need for social care and family support.

The 'costs' side of the cost-benefit equation do not normally note the value of lost food and beverage sales that would be implied by a population-wide change in dietary patterns. For obesity, the increased body-mass of consumers seen over the last three decades has been calculated to be worth over £US60bn annually in higher sales of foods and beverages, in the USA alone.²¹ It might also be argued that there are economic benefits to industries offering specialist food products for weight loss, including the 'diet' soft drinks industry, which might be damaged by a reduction in population obesity prevalence. Additionally, there may be costs for industry to reformulate a product so that it falls into a lower tax category.

The reduction of health care and social care costs are described as a 'benefit' in the cost-benefit analyses. If these costs are a part of GDP (in the USA health care is estimated around 18% of GDP) then a reduction in care costs could be described as a reduction in GDP. Therefore, when national GDP is used to indicate economic prosperity, a reduction in health care costs would imply a reduction in national prosperity GDP. Any discussions of costs and benefits needs to clarify how they measure economic prosperity and how they measure human wellbeing.

Equity and human rights

Health-related taxes are designed to fulfil two purposes: to disincentivise purchase by raising the price of the product deemed unhealthy, and to raise tax revenues which may or may not be directed specifically for health purposes. The application of health-



related food taxes is criticised by some parties (see 'acceptability' below) for their impact on lower income households, for whom food purchases constitute a substantial part of their earnings, making the tax regressive (taking a larger percentage of income from low-income earners than from high-income earners). Equally, if it is more effective as a disincentive among higher-level consumers of unhealthy products, it would have a greater targeted impact on health improvement.

The evidence for social disparities in the impact of health-related food taxes has depended primarily on modelling using econometric methods for estimating consumer demand in relation to price fluctuation, and most recently on the few examples of real-life case studies. Recent examples include Peñalvo et al (2017)²² showing health benefits of food taxes to be greatest among lower socio-economic populations in the USA, and Lal et al (2017)¹⁵ showing greatest health benefits from SSB taxes for the most socially disadvantaged groups in Australia. A second Australian modelling study²³ found that a volumetric SSB tax (20c per litre) gave greater reduction in per capita bodyweight than a valoric tax (20% of sale price) and also imposed a lower tax burden, and that this comparison held especially for lower-income households.

A systematic review of 11 studies²⁴ found that taxation of SSBs would be expected to lead to similar reductions in bodyweight across all socio-economic groups with some studies showing greater bodyweight benefits in lower socio-economic groups (higher consumers). A second review of 12 studies²⁵ concluded that taxation reduced consumption among those who consumed most, and that health benefits were therefore likely to be distributed similarly.

A modelling study in Denmark which specifically examined how households in different socioeconomic groups would respond to fluctuation in food prices showed that even small changes in value added taxes could differentially improve the diet of poorer people.²⁶ The study focused on the consumption of saturated fats, fibre and sugar and found the impact of taxes is stronger for lower social classes than in other groups of the population.

For the case studies, two series of documents are available, one on the impact of taxes on products high in salt and sugar (known as the Public Health Product (PHP) tax) introduced in Hungary in 2011, and one on the impact of similar taxes introduced in Mexico in 2014.

Hungary

A peer-reviewed paper by Biró (2015)²⁷ used data collected a little more than year after the introduction of the PHP tax, and compared the pattern of household purchases of 'processed' (including taxed) foods and 'unprocessed' (not including taxed foods) during the previous five years. Beverages were excluded from the analysis as the consumption data could not distinguish sufficiently the taxed from the untaxed types of product. The author reports small but significant changes in the patterns of consumption following the introduction of the PHP tax:

- Purchased quantities of processed foods declined after the tax (3.4%) not only in the categories that were subject to tax but other categories too (e.g. processed meat and dairy products);
- Expenditure on processed foods increased after the tax (6.5%);
- There was no change in the purchased quantities of unprocessed foods and weak evidence of an increase in expenditure on unprocessed foods;



- The increased range and size of the tax imposed in January 2012 led to a stronger rise in the purchase of unprocessed foods;
- For households in the lowest income quartile, expenditure on and quantities purchased of both processed and unprocessed foods declined, especially expenditure on processed foods;
- Households in the top two income quartiles showed the greatest increase in expenditure on processed foods.

From these findings Biró (2015)²⁷ concluded that the tax had the desired effect of improving the healthfulness of the diet primarily among lower income households, probably because lower income families were likely to have a higher sensitivity to food prices, while better-off households tended to absorb the extra costs of the tax.

Evaluations published jointly by the WHO and the Hungarian National Institute for Health were based on survey data, taking a sub-sample of the 2014 Hungarian National Diet and Nutritional Status Survey of adults.^{9,28–30} Data were collected by interview, which included items on product consumption frequency, changes in consumption patterns since the PHP tax, the reasons for changing consumption, what products were being substituted, as well as knowledge about the PHP tax and the products taxed. Interviewee background variables included educational level and anthropometric measures (height, weight and waist circumference). Results showed:

- The majority of consumers maintained a lower consumption of the taxed products, with a significant minority showing lower consumption in 2014 than a previous study found in 2012;
- A significant number of participants stated that they cut their consumption due to awareness of the unhealthfulness of the products. A second reason for reducing consumption (especially for sugary drinks) was the increased price;
- Reduced consumption of unhealthy products was more common among adults with overweight and obesity compared with adults with normal weight or underweight. Socio-economic differentials were found (see Table 2);
- In every product group, a greater proportion of adults with lower (primary) education than with higher education changed their consumption in one way or another;
- A change to lower-priced products and to different (cheaper) brands was found among those adults with lower levels of education compared those with higher levels of education;
- Among lower-educated adults who reduced consumption, only a small proportion stated the reason was based on discovering that the product was unhealthy whereas price was a reason cited by a large proportion.

The evidence in the evaluations of the Hungarian PHP tax supports modelling studies which predict that people in lower socio-economic groups are particularly sensitive to price and will find cheaper products and brands and reduce overall consumption following price rises. The fact that higher income groups tended to continue their original consumption patterns and to pay the PHP tax indicates different price elasticities and behavioural responses across socioeconomic groups. It also indicates that tax revenue can be raised from higher income earners, and in the case of the hypothecated arrangement in Hungary, this revenue is dedicated to public health service provision in the country, a counter-regressive measure.

Mexico



A series of papers from the Mexican Institute for Public Health, published with the University of North Carolina and supported by the Robert Wood Johnson Foundation, have analysed the data on sales of soft drinks and on non-essential (snack) foods, after the introduction of the health-related taxes in January 2014.³¹⁻³³ The evidence has been used widely in policy-related documents, for example by Public Health England (PHE) (2015)³⁴ and the WHO (2016).³⁵

In summary, first year data showed purchases of taxed beverages decreased by 4% initially, rising to a 12% decline by December 2014.³³ All three socioeconomic groups analysed showed a reduction in purchases of taxed beverages, but reductions were higher among the households of low socioeconomic status (SES), averaging a 9% decline during 2014, and up to a 17% decrease by December 2014, compared with pre-tax trends.

A second-year study³⁶ showed purchases of taxed beverages decreased 5.5% on average in 2014 and 9.7% in 2015. Households at the lowest socioeconomic level had the largest decreases in purchases of taxed beverages in both years. A second paper on this data showed that, among households with the highest levels of consumption of taxed beverages, those with lowest SES had the greatest reduction in purchases of taxed beverages.³¹

A study of snack foods³² (non-essential, high-energy dense products which were also subject to a health-related tax) showed post-tax declines in the taxed food purchases of 4.8% in year one and 7.4% in year two, yielding a 2-year mean decline of 6.0%. Households with greater preferences for taxed foods showed a larger decline in taxed food purchases.

Evidence gaps

Modelling studies usually rely on measures of price elasticities calculated from large populations, but these elasticities may not apply uniformly, and may be inappropriate in some small population groups, where taxes may have unexpected consequences. Descriptions of aboriginal purchasing habits in remote Arnhem Land communities in northern Australia indicate that *'customers will pay almost anything for something they want. Conversely if they do not want something it is impossible to give it away.'*³⁷ In some aboriginal communities over 60% of the food budget is spent on less healthy (discretionary) foods, despite a very low level of per capita income, and moves to increase the price of these foods through taxation could serve to restrict even further the amount spent on core, healthier products.³⁸

In a discussion of the policy implications arising from health-related food taxes Wright et al (2017)³⁹ noted the regressive nature of the tax but suggested that lower-income groups may be more price sensitive than other groups, and therefore more likely to change their behaviour in response to a tax, and the burden of the tax may shift more to wealthier consumers. At the time of writing (2017) the authors stated: *'Available research does not sufficiently address the question of whether, among low-income consumers, the overall benefits of tax-induced price increases (i.e. reducing consumption of unhealthy products) outweigh the risk of harm from financial hardship for those who do not reduce consumption.'* This merits further research to assess the generalisability of assumptions that the taxes are not regressive, especially among groups for whom dietary health may not be their highest priority.

Similarly, there are few studies of subsidies of healthier types of food as a means to improve health, in the context of social inequalities. Localised interventions may show impacts on target groups but their sustained impact on health may not be evaluated. More helpfully, national schemes to support free school meals, free fruit and vegetables for children, food vouchers for low income women and children or for pregnant women, are



all valuable targeted schemes to improve overall nutrition, and are implemented in many countries, but their assessment lies outside the current review. There is a lack of evidence on the relative merits of subsidies *versus* taxes in their impact on health, especially in sub-populations.

The modelling studies do not appear to include an analysis of the costs of health care borne by individuals or households. In countries where insurance schemes are not universal and comprehensive, the introduction of health-related food taxes may reduce the health care contributions to the extent they reduce consumption of unhealthy foods, and those savings may offset any continued costs they pay when purchasing taxed foods.

Further evidence is needed on how the food industry responds to nutrition-specific taxes by reformulating products, particularly beverages, to bring their nutrient-related content below taxable thresholds. This can potentially increase the public health benefit of the measure, especially among higher consuming groups. In the case of the UK levy on SSBs, over 50% of manufacturers took action to cut sugar in their products: for example AG Barr, makers of IRN-BRU, said 99% of its product portfolio was reformulated to fall below the taxable threshold, and Lucozade Suntory Ribena reformulated all its drinks to contain less than 5g sugar per 100ml, resulting in 50% cuts to the sugar content of its flagship products Ribena, Lucozade Energy and Orangina.⁴⁰ As a result, the predicted revenue for the UK government of £520 million in its first year of operation was revised down to £275 million following these company efforts to remove sugar from their products.⁴⁰

Acceptability for stakeholders

In this section we report the documented views of stakeholders by category, as shown in the table below. Few peer-reviewed papers were found in the searches, so additional material was sought in consultation responses, stakeholder statements and grey literature reports. This may lead to conclusions that are biased by the availability of material or the type of source. It is a major concern and needs addressing in further, more rigorous analyses.

Stakeholder	Supportive	Opposing
General public	South Korea: 72% adults support health taxes in general (includes tobacco and alcohol and unhealthy food). ⁴¹ New Zealand: broad support across stakeholders, ⁴² and 10,000 petition to government for tax. ⁴³ Australia: citizens' juries support for three measures – education, front-of-pack labelling, and food taxes. ^{44,45} USA: tax support strongest among Democrats, women and those concerned for child obesity ⁴⁶ and when reinvested in health. ⁴⁷ Israel: Support for tax dependent on use for health promotion (mix of stakeholders). ⁴⁸	South Africa: Cynicism that the tax is for health purposes, not government revenue. ⁴¹ UK: mistrust of the use of the revenue, and concern tax is insufficient or ineffective as a dietary intervention. ^{39,49} USA: a public opinion survey in 2011 found the majority viewed SSB taxes as arbitrary and ineffective for changing general dietary behaviour, an intrusion into privacy, and harmful to the poor. ⁵⁰



Government	21 countries are reported to have imposed or increased taxes on unhealthy foods in the period 2011-2016/17. ⁷⁹ Thirty-eight countries are listed in the WCRF NOURISHING database with current or previous health-related food taxes. ³ The OECD reports that 14 member countries plus India, Saudi Arabia, Peru and South Africa have such taxes. ⁷ Policies in favour of health-related taxes are recommended by the WHO-appointed Commission on Ending Childhood Obesity (Rec 1.2). ⁵¹	Denmark: abolished fat tax for financial reasons (also lobbying by industry and weak support from public and health professionals). ⁵²
Industry: manufacture	UK: 22% not opposed to SSB levy in treasury consultation. ⁵³	South Africa: Preference for self-regulation and public-private partnerships. ⁵⁴ Denmark: strong lobbying and judicial action against fat tax. ^{52,55} UK: 78% opposed to the SSB levy, expressing concerns over definitions of sugar (added, free, extrinsic) and the inclusion of juices or milk drinks ⁵³
Industry: retail	UK: treasury consultation – SSB levy received support from large majority (73%) of retailers. ⁵³	
NGOs	Australia: ten leading health and community organisations support tax. ⁵⁶ UK levy supported Jamie Oliver Foundation, Sustain, Obesity Health Alliance, Food Foundation, and many others. ^{57,58}	UK: Institute for Economic Affairs, UK Tax Payers' Alliance, and campaign group 'People Against the Sugar Tax'. ⁵⁸
Health professions	Supported by US Society of Behavioral Medicine, ⁵⁹ Dietitians of Canada (2016), ⁶⁰ British Medical Association (sugar tax with fruit and veg subsidy) ⁶¹ and other UK medical bodies. ⁶² UK: 95% of medical and health bodies who responded to treasury consultation on SSB levy were supportive. ⁵³	
Media	UK survey of media content found supportive articles outnumbered critical ones, except in the month of the announcement of the SSB levy. ⁶³	
Intergovernmental organisations	WHO has several policy documents and advocacy materials promoting food-related fiscal policies for health. ³⁵ WHO	



	<p>EURO recommends member states to consider economic tools, including supply chain incentives, targeted subsidies and taxes, to promote healthy eating, with due consideration to the overall impact on vulnerable groups.⁹⁶</p>	
--	--	--



41 Front-of-pack nutrition labelling interventions

Costs and resources

The OECD has indicated cost benefit advantages to be gained from 'regulatory measures that improve nutritional information', primarily through front-of-pack food labelling.⁶ The study was a general comparative modelling study using data from Brazil, China, India, Mexico, Russia, South Africa, and England. The assessment of the costs is described only sparsely as 'administration, training, mass media, and other activities', but the use of food labelling measures is endorsed as cost-effective. A set of papers from the OECD is currently in press, and include estimates of the costs to industry of policy interventions including food labelling.⁷ For labelling, the costs are dependent on redesign and printing labels, and possibly reformulating products to improve their labelling profiles.

Very few research papers make estimates of the costs of implementing front-of-pack (FOP) labelling measures. The 2009 ACE Obesity¹⁰ studies on cost-effective policies did not assess labelling interventions, but an update from Sacks et al (2011)¹¹ modelled Australia data and estimated that a traffic-light labelling scheme would cost \$AU 81m annually after introduction (including implementing the legislation and food industry labelling costs). This study used the WHO-CHOICE¹² methods for estimating cost-effectiveness of health policies, and found the measure to be dominant (i.e. to save more than it cost).

Evidence gaps

There are large gaps in the evidence base, as can be seen from the paucity of evidence described above. As noted earlier, cost-benefit analyses focus on benefits provided by reduced health care costs, and the estimates for these health care costs are usually restricted to the main NCDs linked to diet. Such studies often do not include diet-related ill health such as dental disease, or disease consequential on obesity (such as sleep apnoea and lower back pain, or psychological responses such as low self-esteem). They could also include the wider societal costs that would be reduced if health improved, including work productivity and reduced need for social care and family support.

Also as noted earlier, the reduction of health care and social care costs are described as a 'benefit' in the cost-benefit analyses, but could be described as a reduction in GDP, a measure of national prosperity GDP. Any discussions of costs and benefits needs to clarify how they measure economic prosperity and how they measure human wellbeing.

The 'costs' side of the cost-benefit equation do not normally note the value of lost food sales that would be implied by a population-wide reduction in food energy consumption (to meet obesity targets), or replacing soft drinks with tap water. Effective front-of-pack labelling would be expected to lead to reduced sales of the less healthy products, and it is not clear what may replace them. There are costs to the food industry in reformulating to improve the label profile, and in marketing and promoting the reformulated products.

Equity and human rights

There are few studies of the impact of FOP nutritional labelling (FOPNL) differentiated by ethnic, educational, occupational or other socio-economic group. There is a limited amount of data from the UK, which implemented a policy of voluntary FOP traffic-light



labelling since 2006, and from France which introduced a voluntary colour-coded FOP label in 2017.

UK case study

Methodological approaches differ: in some trials the researchers used a consumer panel to provide assessments of different designs for comprehension and choices, or a focus group to provide insights and opinions on suitability of label designs. In one UK study, data were collected by a retailer electronically at the point of sale, before and after the introduction of a 'traffic light' colour-coded FOP labelling scheme.

Among adults, a panel trial of % Guideline Daily Amounts (%GDA, a scheme proposed by the food industry to summarise the content of key nutrients numerically) and traffic light formats showed that %GDA was better understood by participants in social classes A,B and C1 compared with social classes C2, D and E.⁶⁴ 76% of adults in the A,B,C1 group understood the %GDA format, compared with 60% of adults in the C2,D,E group. Despite being unfamiliar with the colour-coding based on per 100g portions, a greater proportion of lower-class adults (24%) compared with higher class adults (17%) understood that a red signal implied high-level of a relevant nutrient (either per 100g or per product).

A series of panel tests conducted for the Food Standards Agency⁶⁵ found that the coexistence of a number of different label formats in the marketplace causes consumer confusion and a single approach would enhance use and comprehension of labels. The best-comprehended component used on labels was text (the words 'high, medium and low'), the next best was traffic light colour coding and the least comprehended was %GDA information. A format which combined all three approaches in one display had the highest comprehension for all SES groups.

The UK government launched a series of 'citizens' forums' comprising a nationwide series of discussion groups set up to establish a dialogue with the public on food.⁶⁶ Topics included FOP labelling and the summary report from the citizens' forums noted *"... concern that those with poor numeracy and literacy skills could find certain numerical elements on the Front of Pack - such as percentage of GDA or amounts of nutrients in grams - difficult to manipulate and make comparisons with. These individuals lacked confidence in dealing with numbers and as such were likely to feel discouraged from using the labels or reach incorrect conclusions as to the nutritional value of a product when using them."* (p.22-23).⁶⁶

A second comment echoed these concerns: *"...respondents perceived that the use of nutritional values to make healthier choices required the consumer to calculate the amount of nutrients contained in the food they have chosen and the amount consumed across the day. This was considered inconvenient or difficult to use, especially for those consumers with poor numeracy and literacy skills. Having too much information on the nutrition label, for example expressing the nutritional values in grams and as a percentage of the Guideline Daily Amount, could also be confusing for these consumers."* (p.30)

It should be noted that a UK government survey in 2011 found 29% of the adult population had insufficient numeracy skills (below Level 2) such that "they may not be able to compare products and services for the best buy, or work out a household budget."⁶⁷

In a different approach, a study of retailers electronic sales figures before and after the introduction of a limited set of products carrying the UK 'traffic light' colour-coded FOP signalling was undertaken in 2007.⁶⁸ Sales figures for the four weeks prior to label introduction and the four weeks following were analysed for two product categories: ready meals and sandwiches. Data for ready meals included subgroup analysis for social group. Results showed that all products increased in sales, but the increased sales for the



healthiest product tended to be greater than for the least healthy products for most sub-groups, including lower-income or less educated consumers.

France

A French study of consumer behaviour in a laboratory model retail environment compared five FOP labelling formats and evaluated purchasing behaviour of a panel of shoppers before and after the introduction of each format label.⁶⁹ The participant's scores were analysed for the group as a whole (691 participants) and also for the subset of participants whose monthly household income fell below €2000 (270 participants). The results showed that income levels made little difference to the results: the NutriScore format (later adopted by the national government) remained the most effective, with an increase in the healthfulness of their choices shown by the lower income participants that was nearly as large as that seen for the group as a whole. A similar study from the same research group found the colour-coded Nutri-Score format to have the greatest impact among individuals with no nutritional knowledge, compared with other formats.⁷⁰

These findings support earlier results from the same research group that showed that the highest percentage of participants favouring simpler formats (e.g. a single symbol or single set of traffic lights rather than multiple traffic lights) came from lower educated groups and manual workers, while the highest percentage of participants favouring more complex formats (such as multiple traffic lights and a spectrum model) were from higher-educated groups and managerial workers.⁷¹ That paper concluded by suggesting that simpler formats should be preferred *"so as to efficiently target subgroups with low socio-economic status and poor nutritional knowledge, and who are thus at higher risk of diet-related chronic diseases than other segments of the population"* (p401).

The authors of the 2017 study conclude that the NutriScore format is significantly more efficient than others, including for disadvantaged populations. This conclusion was echoed in a statement made by the French health minister, Marisol Touraine, when she launched the scheme in March 2017: *"The first question was whether or not simplified nutrition labelling systems were likely to lead to changes in consumers' purchasing behaviour. The answer is clearly yes ... The combination of multiple approaches systematically explored (by categories of products, buyers, etc.) reveals a clear overall superiority for Nutri-Score ... This advantage of Nutri-score is even more marked when we observe specifically the behaviour of consumers who buy the cheapest products."*⁷²

Evidence gaps

There is a lack of evidence across groups for the use and understanding of front-of-pack labelling. Acceptance and use of FOP labelling appears to be best for labels with interpretative colour-coding, and this applies to less educated, lower income, or lower-numerate consumers nearly as much as other consumers. It is not known if this would also apply to children, who can be presumed to understand the colours of traffic lights where they might not understand percentage daily intake or other formats. No studies were found on children's use of FOP. There is also very little information on numeracy and literacy levels in relation to the use of nutrition label information.⁷³

The presence of interpretative FOP labelling (e.g. with traffic light signals or other formats) may encourage manufacturers to reformulate their products towards a healthier profile. Lower income and lesser educated individuals tend to be less likely to use nutrition information displayed on the pack, so reformulation towards more healthful products would benefit all consumers in proportion to their purchases of the products, even if they do not read the label information. There is evidence that has proven to be the case for the Choices logo used in the Netherlands.⁷⁴ It is reported that no reformulation occurred in



Chile prior to the introduction of their FOP legislation, with strong warnings on the front of less healthy foods, in 2015.⁷⁵

Acceptability for stakeholders

In this section we report the documented views of stakeholders by category, as shown in the table below. Sources include consultation responses (the UK government's proposals concerning FOP labelling) and various peer-reviewed and grey literature reports.

Stakeholder	Supportive	Opposing
General public	Many public-interest consumer organisations call for interpretive FOP labels. ⁷⁶ As FOP labelling becomes more widespread, recent surveys show public support (e.g. Canadian youth, ⁷⁷ Australian parents ⁷⁸ UK retailers have reported that their customers have demanded traffic light colours on FOP labels on products. ¹³⁹	Some concerns over the FOP format: multiple traffic lights vs single colour, keyhole symbol, and numerical formats, and socio-economic impacts. ^{66,70}
Government	Implementation of FOP labelling is reported in 55 of 153 countries in 2016-17 with some based on mandatory measures and some on voluntary measures. ⁷⁹	Italian government resisting traffic light format ⁸⁰ and may indicate wider EU member state opposition to some forms of FOPNL. ⁸¹ This is implied in the EU and Member States' submission to Codex, published by the European Commission, which conditionally opposes warnings on labels: <i>'individual warnings such as "high in sugar", "high in salt/sodium", "high in saturated fat" do not reflect the objective ("to increase the consumer's understanding of the nutritional value of their food and to assist in interpreting the nutrient declaration") and therefore, should not be considered as FOPNL. Indeed, they do not allow the consumer to understand the complete nutritional status of the product but only draw the consumer's attention to (a) single nutrient(s) in high quantity.'</i> ⁸²
Industry: manufacture	Most manufacturers support %GDAs, some support interpretive FOP formats including colour coding. ^{80,83}	Historic opposition to traffic light schemes as 'demonising' individual products. Continues in some countries, e.g. Italy. ⁸⁵



	<p>Nestlé: Recent moves to promote traffic light labelling in EU subject to regulatory approval.⁸⁴</p>	<p>Labels should not deter "the most healthy and genuine pleasures" Ferrero.⁸⁶</p> <p>FoodDrink Europe have urged Codex to ensure the FOPNL proposal follows existing guidance on claims and labels, especially to avoid labelling "<i>which could arouse or exploit fear in the consumer</i>". .. and that the information contained in the nutrient declaration "<i>should not lead consumers to believe that there is exact quantitative knowledge of what individuals should eat in order to maintain health, but rather to convey an understanding of the quantity of nutrients contained in the product.</i>"⁸⁷</p>
<p>Industry: retail</p>	<p>Many retailers (majority in UK) have adopted FOP labels.⁸⁸</p> <p>FOP labels have increased demand for healthier foods.¹³⁹</p>	<p>UK: some opposition to traffic light formats in 2011.⁸⁹ Tesco</p> <p>UK: 'Overly complex labelling requirements are difficult to comply with and difficult to enforce even for well-resourced companies. ... a particular challenge for smaller and medium sized suppliers ... imposes cost burdens and increases the risk of non-compliance.'⁹⁰</p>
<p>NGOs</p>	<p>Consumers International support Codex measures for FOPNL if they '<i>are government mandated; support the right to health; are aligned with WHO recommendations; protect a country's ability to develop a FOPNL that is suitable to that country's needs and responsive to their disease burdens; and protect against conflict of interest</i>'.⁹¹</p> <p>UK consultation response: consensus support for consistent, single system of FOP labels which combines interpretive additional forms of expression: traffic light colours and wording 'high, medium, low' for energy, fat, saturates, sugars and salt; labels should be informative and easy</p>	<p>Numerical formats (e.g. % GDAs) not understood by many adults or children (see 'equity' concerns, above).⁹⁴</p> <p>UK consultation consensus opposition to %GDA labels: unclear whether they represent a maximum or a target amount; based on arbitrary portion sizes; GDA signals lack colour coding; not shown to support consumers across all socioeconomic groups or incentivise reformulation.⁹²</p>



	<p>to understand ‘at a glance’ and interpretive additional forms of expression incentivise food businesses to reformulate foods and drink.⁹²</p> <p>British Market Research Bureau: FOP labels with interpretive additional forms of expression are helpful for consumers across all socioeconomic groups.⁹³</p>	
Health professions	<p>Consensus support in UK for consistent, single system of FOP labels which combine interpretive additional forms of expression: traffic light colours and wording ‘high, medium, low’ for energy, fat, saturates, sugars and salt; they should help consumers to know ‘at a glance’ what is in the food at point of purchase, and this should incentivise food businesses to reformulate foods and drinks.⁹²</p> <p>FOP labels with interpretive additional forms of expression are helpful for consumers across all socioeconomic groups.⁹³</p>	<p>Concern that the Codex process could lead to guidance reflecting the ‘lowest common denominator’ and could limit or constrain policy space for countries desiring to implement innovative, mandatory, and/or strongly interpretive (rather than descriptive) forms of labelling.⁹⁵</p>
Intergovernmental organisations	<p>WHO EURO recommends member states to adopt easy-to-understand or interpretative, consumer friendly labelling on the front of packages.⁹⁶</p>	

Evidence gaps

As a general policy, FOPNL is widely supported. Differences emerge according to how the information is formatted, with public, consumer and health communities looking for easily understood, non-numerical interpretative formats. Further research may examine different formats to assess their value for aiding less well-educated purchasers to choose healthier options. Different countries, cultures and cuisines may need different approaches, and different approaches need evidence-based foundations to avoid legal challenge.⁹⁸

FOP labelling is an emerging area for policy and for science. Research is patchy and the ground is changing: new formats are developing in several countries, and stakeholder positions changing: e.g. food producers’ opposition to colour-coded forms of interpretative labelling in the early 2000s appears to be giving way to support, at least in Europe, for a colour-coded scheme like the UK traffic lights but based on portion sizes rather than 100g,⁹⁹ or to adopt the French NutriScore format.¹⁰⁰ This changing scene makes evaluation necessary on a continuing basis.



42 Interventions to restrict children's exposure to the marketing of unhealthy foods and beverages

Costs and resources

The work by the OECD also considered cost benefit advantages to be gained from measures to restrict the marketing of unhealthy foods to children.⁶ The study was a general comparative modelling study using data from Brazil, China, India, Mexico, Russia, South Africa, and England. The assessment of the costs is described only sparsely as 'administration, training, mass media, and other activities', but the use of regulations to reduce children's exposure to promotional marketing of less healthy foods and beverages is the single most cost-effective measure analysed by the OECD authors.

A set of papers from the OECD is currently in press, and include estimates of the costs to industry of policy interventions including marketing,⁷ noting that advertising restrictions can result in cost if an alternative marketing strategy is needed, but the summary notes that 'partial bans have generally resulted in a shift of marketing spend and sales rather than a reduction'. This implies that the costs borne by advertising agencies and by commercial media if food and beverage advertising is restricted will also be offset by other sources of advertising revenue.

The 2009 ACE Obesity¹⁰ studies on cost-effective policies included 'reduction of TV advertising of high fat and/or high sugar foods and drinks to children' as one of the policy interventions modelled for cost-effectiveness. The policy was the most cost-effective of the thirteen child-oriented policies evaluated. Costs were based on the need for monitoring and enforcing compliance with revised regulation, and they did not include any costs associated with changing the regulations, additional food costs to families in switching products, or the impact on revenue stream of advertising companies or producers of foods. A recent study from Australia by Brown et al (2018)¹⁰¹ modelled the cost-effectiveness of restricting TV advertising of foods high in fat, sugar or salt (HFSS) until 9.30 pm, and found the measure likely to be cost-saving, with 1.4 times higher total cost-savings and 1.5 times higher health benefits in the most disadvantaged socioeconomic group.

Gortmaker et al (2015)¹⁴ included a slightly different policy in an analysis of cost-effectiveness of seven interventions for childhood obesity. It used systematic reviews and a microsimulation modelling approach to estimate the cost effectiveness of removing tax subsidies for advertisements promoting unhealthy food and beverages to children (i.e. removing such advertising from tax-deductible expenses claimed by businesses in their tax returns). This measure was estimated to be cost saving, the benefits in health care savings being greater than the costs to implement the policy.

Evidence gaps

One of the major gaps in the evidence available is digital marketing, using social media, brand-owned web-based media, video bloggers and others forms of digital media platforms for marketing messages. Children's exposure is likely to be higher, as web-based messages may be viewed for longer periods than TV commercials, may involve children using advergames, and children may be encouraged to reproduce and recirculate commercial messages, known as viral marketing, supported by user-generated branded messaging. There is a lack of evidence in the peer-reviewed literature, but these issues are currently gaining attention in policy circles (e.g. WHO EURO's reports *Tackling*



*food marketing to children in a digital world: trans-disciplinary perspectives*¹⁰² and *Monitoring and restricting digital marketing of unhealthy products to children and adolescents*¹⁰³ and UNICEF's report.¹⁰⁴

As we have found with the previous interventions, there are large gaps in the evidence base, as can be seen from the paucity of evidence described above. As noted earlier, cost-benefit analyses focus on benefits provided by reduced health care costs, and the estimates for these health care costs are usually restricted to the main NCDs linked to diet. Studies could be extended to include a wider range of conditions and include the wider societal costs that would be reduced if health improved, including work productivity and reduced need for social care and family support.

Also as noted earlier, the reduction of health care and social care costs are described as a 'benefit' in the cost-benefit analyses, but could be described as a reduction in GDP, a measure of national prosperity GDP. Any discussions of costs and benefits needs to clarify how they measure economic prosperity and how they measure human wellbeing.

As is the case with front-of-pack labelling, the 'costs' side of the cost-benefit equation do not normally note the value of lost food sales that would be implied by a change in dietary patterns through reduced consumption to meet obesity targets, for example, or a switch from sugary drinks to tap water to meet dental health targets. Restrictions in marketing, if successful, could lead to a fall in sales of the less healthy products, and it is not clear what may replace them. There are costs to the food industry in reformulating to permit advertising and promoting the reformulated products to children.

Equity and human rights

Human rights issues are clearly expressed in papers concerning children and food marketing. Whereas policies to introduce front of pack food labelling can be justified on grounds of consumers' rights to clear product information, and whereas food taxes can be justified on the rights of governments to raise revenue, there are more complex competing rights expressed on the issue of marketing to children. On the one hand, there are well-recognised rights to advertise – i.e. to promote brands and provide incentives and inducements to purchase goods and services – and on the other there are rights of children to be protected from inducements to participate in unhealthy behaviour. These latter rights may be expressed through policies that attempt to secure a 'commercial free childhood' with a comprehensive approach to reducing children's exposure to promotional marketing for all products, or they may be expressed in terms of risk management, i.e. protecting children from commercial messages for specific products defined as potentially hazardous, and this may include unhealthy food products (defined, for example, using a nutrient profiling scheme).¹³³

The issue has been well-expressed in the 2018 UNICEF publication *A Child Rights-Based Approach to Food Marketing: A Guide for Policy Makers*,¹⁰⁴ and we will not further discuss these rights issues here. However, we should recognise the steps taken by WHO's member states to implement the WHO set of recommendations to limit children's exposure to and power of the marketing of food and non-alcoholic beverages¹⁰⁵ alongside the protection of infants and young children from the marketing of breastmilk substitutes¹⁰⁶ and recent moves to tackle inappropriate promotion of complementary foods for older infants.^{107,108}

While there is considerable evidence linking SES to dietary patterns, including higher levels of consumption of foods which are highly advertised – notably soft drinks, sweetened breakfast cereals, confectionery, savoury snacks and fast food stores – there



is a lack of clear evidence linking the advertising of these products to consumption levels in the population or among children in particular, or differential advertising by SES. Such evidence would provide a potential causal link between differential exposure to marketing and differential consumption patterns

A review by Lupiáñez-Villanueva et al (2016)¹⁰⁹ used mixed methods including a literature review to analyse marketing through social media, but found a lack of definitive evidence. They found evidence that *'children from families with a higher socioeconomic status were able to recognise other types of food logos that differed from the popular fast food'* and also differential concerns by parents about digital advertising, those who described themselves as part of the lowest social status groups tended to worry more about data tracking, digital identity theft, unhealthy lifestyle ads and spending too much money on in-app purchases, while parents of higher social status groups showed more concern about targeted advertisements in addition to data tracking and digital identity theft.

A review by PHE¹¹⁰ found insufficient evidence but noted the potential for differential responses to marketing interventions. The review cited a study by Adams et al (2012)¹¹¹ of family viewing and exposure to food advertising, which found total exposure to all food advertising and to HFSS food advertising was 2.1 times greater among the least compared with the most affluent viewers.

In a study of US television family programming, Harris et al (2010)¹¹² found fast food advertisements appear more frequently during African American-targeted TV programming than during general audience programming.

In a controlled study, also in the USA, Zimmerman et al (2014)¹¹³ found that low-income students ate more unhealthy snacks (and more total calories) after advertising exposure than higher income students.

A study in Norway by Klepp et al (2007)¹¹⁴ found that lower class children watch more TV, and have greater exposure to both healthy and unhealthy food advertisements. Children exposed to healthier food advertisements ate more fruit and vegetables.

A correlational study of the Health Behaviour of Schoolchildren survey by Vereecken et al (2006)¹¹⁵ found higher levels of TV viewing in lower class households. Higher viewing was significantly associated with greater consumption of confectionery, snacks and lower consumption of fruit and vegetables (after controlling for socio-economic status).

A study in the USA by Donohue et al (1978)¹¹⁶ conducted in the 1970s found that children's understanding of the intention of advertising differed by ethnic group: 39% of children from African-American households did not understand the intention of advertising, compared with 18.9% of white children.

Lastly, a review by Mills et al (2013)¹¹⁷ noted the lack of evidence, reporting that *'important details such as socioeconomic position and ethnicity were rarely provided'*. A review of health inequities and food marketing for the European Commission (2017)³⁰ noted *'[t]here is a significant lack of evidence on which to base a firm conclusion. [In principle,] interventions in marketing would benefit all groups without widening or narrowing SES differentials in health behaviour. Interventions to reduce TV advertising should have greater impact in lower SES groups, as both exposure and responsiveness to advertising of unhealthy foods are highest in lower SES groups.'*

Evidence gaps

There is a serious paucity of evidence on the differential impact of advertising on children across social groups. A growing body of literature using laboratory controlled trials is able to show how advertisements for foods impact on food intake,¹¹⁸ but few of these



studies consider the demographic differences of the participants, and if the data is collected it is used to adjust the findings to remove any differential effect. Research funders should be urged to require differential examination of potential inequities in health and response to unhealthy food environments in future research programmes.

Acceptability for stakeholders

In this section we report the documented views of stakeholders by category, as shown in the table below. Sources include consultation responses, stakeholder statements, and various peer-reviewed and grey literature reports.

Stakeholder	Supportive	Opposing
General public	Opinion polls (UK) show a majority (69%) support comprehensive measures to protect children from HFSS food marketing pressure across all media. ¹ In South Korea 44% of a sample of general population adults supported controls on TV food marketing, ¹¹⁹ and 56% in the USA (with 8% strongly opposed), ¹²⁰ and widespread support across Europe. ¹²¹	Concerns in Mexico over limiting free speech, ¹²² views that parents are responsible, not companies. ¹²³
Government	In 2016-17, 30% of 142 countries reported policies on regulating food marketing to children. ⁷⁹ PHE identified food and drink marketing as factors influencing excess intakes of less healthy foods including those high in sugar, as part of its review of action to reduce sugar intakes in 2015. PHE concluded that 'it is likely that taking a broad range of actions on marketing and promotions would reduce purchase and therefore consumption of higher sugar foods and drinks, helping to lower sugar intakes and improve diets.' ¹²⁴ This could be achieved by setting 'broader and deeper controls' on advertising in broadcast and non-broadcast media.	
Industry: manufacture		Support voluntary but opposed to mandatory regulation: have undertaken gradual introduction of increasingly specific voluntary measures through the IFBA ¹²⁵ and regional initiatives such as the European Pledge ¹²⁶ and the US CFBA. ¹²⁷

¹ YouGov Plc. Total sample size was 2078 adults. Fieldwork was undertaken between 12th-13th February 2019. The survey was carried out online. The figures have been weighted and are representative of all GB adults (aged 18+).



<p>Industry: advertising</p>		<p>UK Advertising Association: Children’s exposure to HFSS advertising is low and insignificant; calorie intakes have decreased in recent decades; the key factors associated with child obesity are not caused by advertising, nor can be remedied by its absence; HFSS advertising restrictions implemented in the UK (which are amongst the strictest worldwide) have failed to reduce or curb a rise in child obesity; efforts to tackle obesity should focus on increasing levels of physical activity and community-level interventions.¹²⁹</p>
<p>NGO</p>	<p>UK Obesity Health Alliance (multiple NGOs): Governments have a duty to protect children from commercial pressures to consume unhealthy food; legislative, regulatory approaches are preferred to self-regulation; a watershed restriction (05.30-21.00) on HFSS advertising on TV and online is recommended.¹³⁰</p> <p>Consumers International and World Obesity Federation: draft <i>Global convention for protecting and promoting healthy diets</i>: Restricting advertising, promotion and sponsorship of unhealthy food and beverage products will help to reduce consumption.¹³¹</p>	<p>Opposed to self-regulation as ineffective: focused on advertising, selective marketing communications and platforms; lacking meaningful sanctions; and not effective to address children’s exposure to food and drink marketing.^{132,133}</p>
<p>Health professions</p>	<p>American Heart Association: ‘There is no ethical, political, scientific, or social justification for marketing and advertising low-nutrient, high-calorie foods to children.’¹³⁴ The British Medical Association supports stronger controls on advertising to children.¹³⁵ The World Obesity Federation has called for stronger action to protect children from online marketing.¹³⁶</p>	
<p>Intergovernmental organisations</p>	<p>The WHO recognises unhealthy food marketing as a significant, global risk for childhood obesity and the development of diet-related diseases. It has made recommendations for countries to reduce marketing pressure on children, which have been endorsed by the World Health Assembly (2010).¹⁰⁵ The WHO’s</p>	



	<p>Commission on Ending Childhood Obesity (2017)⁵¹ highlighted the need to implement 'legislation or regulation' to reduce the exposure of children and adolescents to, and the power of, the marketing of unhealthy foods. WHO has also developed nutrient profiling models in all six regions to aid the development of marketing regulations.¹³⁷</p> <p>OECD: tightening regulation of advertising through TV, radio and other means helps to reduce children exposure to unhealthy food marketing; OECD report endorses the need for statutory rather than voluntary regulation.¹³⁸</p>	
--	--	--



43 Discussion

This review sets out to consider the three contextual factors: costs and cost-effectiveness, equity and social inequalities, and acceptability to stakeholders, in relation to three proposed policy options: health-related food taxes, FOP nutrition labelling, and restrictions to reduce children's exposure to and power of food and non-alcoholic beverage marketing.

The reviews undertaken here can at best be only indicative of the material available. As we have noted, the research material is sparse and uneven across the themes and policies. For example, estimating the costs and effectiveness of interventions has largely relied on modelling methods in a limited number of countries, and these have rarely been validated against actual policy interventions and their sustained effects over time.

Similarly, demonstration of inequities or social disparities arising from specific policies depends on factors such as differential exposure to the initial risk and to the intended intervention, differential responses and alternative response strategies. Sub-group cross-price elasticities may be significant in some contexts and not others and may fluctuate under external influences such as promotional advertising campaigns, social marketing campaigns and media stories.

Even harder to review comprehensively is the acceptability of policies to stakeholders. Collating the variety and nuance of views across a range of interested parties even in a single member state is a significant research task and has been undertaken in only a few countries. The views and stated positions change over time and are likely to be influenced by media stories or media personalities such as Jamie Oliver, as well as by the underlying beliefs and ideological positions held, on the relative importance of social determinants of behaviour or individual responsibility and freedom of choice.

Despite these caveats, some generalisations can be made, and patterns of evidence described and summarised here:

Cost and cost-effectiveness

All three policy interventions have evidence in favour of being cost-effective, indeed cost-saving, when comparing estimates of the cost of implementing and maintaining an intervention against the health care savings predicted to accrue from the intervention. The health care savings are likely to be underestimates as not all health benefits are considered, nor the savings from reduced social care and increased economic productivity gained from improvements in population health. In the forthcoming OECD analysis of cost-effectiveness of policies for obesity, better food and menu labelling is anticipated to have a significant impact in the near term, while restrictions on marketing to children has the greatest impact long-term, providing \$6.6 saving for \$1 invested. Health-related food taxes are not assessed in the OECD study.

Equity and social disparities

Two case studies, Hungary and Mexico, provide the most substantial evidence of the impact of food taxes on different social groups by income or education levels. Both show a favourable effect, reducing consumption and reducing expenditure on the taxed foods and beverages.

The differential effects of front-of-pack food labelling are dependent on the format of the FOP nutritional information: those formats requiring least literacy or numeracy have greater impact on lower-educated or lower-income consumers. In addition, to the extent that FOP panels drive reformulation, all consumers benefit to the degree that they replace the original with the reformulated products in their diets.



Children's exposure to marketing may have a social gradient, though this is not necessarily the case in all countries as it depends on having easy access to the available media. Restrictions to marketing will benefit children in proportion to their initial exposure. Digital marketing channels are largely unexplored in terms of children's exposure differentiated across household income, parental education or ethnic group.

Stakeholder acceptability

A number of conclusions can be drawn from the evidence described here on stakeholder views. Stakeholders with commercial interest in the sale of HFSS foods can be expected to resist any forms of interference in their market activities, be it through raised prices, front-of-pack information, or restricted marketing.

In contrast, stakeholders concerned with health or consumer protection generally favour increased access to information on processed food packs (especially when these are easily understood) and to the protection of children from commercial inducements to unhealthy behaviour. Increased prices of snacks or sugar-sweetened beverages may meet public resistance and should be mitigated with subsidies for healthier products or with guarantees that the revenue raised from the taxes will be used for socially valuable purposes – in the UK this was for school sports, in Hungary for public health services.



44 Conclusion

The WHO is undertaking systematic reviews of the effectiveness of policy actions to improve food environment in order to promote healthy diets, such as fiscal and pricing policies, nutrition labelling policies (including ingredient lists, nutrient declarations, nutrition claims, and front of pack labelling), and policies to restrict marketing to children. In forming policy guidelines for member states, the WHO also seeks to consider a number of contextual factors, as we have listed in the introduction, and to take these contextual factors into consideration when determining the strength of the policy guideline.

From the literature review undertaken here we make the following summary assessments:

Fiscal policies (health-related food taxes): Highly cost-effective, moderately favourable for health equity, moderately supported by public (depending on the use of revenues), strongly supported by health professionals and NGOs, and moderately opposed by commercial interests.

Front-of-pack nutritional labelling: Highly cost-effective, moderately favourable for health equity (especially when not purely numerical), moderately supported by public, strongly supported by health professionals and NGOs (depending on the format) and moderately opposed by commercial interests (depending on the format).

[Front-of-pack red or black clear warnings: Likely highly cost effective, likely highly favourable for health equity, likely moderately supported by public, highly supported by NGOs and health professionals, and highly opposed by commercial interests.]

Restriction of children's exposure to marketing: Very highly cost-effective (in the longer term), moderately favourable for health equity, moderately supported by public, strongly supported by health professionals and NGOs, moderately opposed by commercial interests (unless voluntary).

Based on these assessments, we believe that all three policy interventions merit adoption and promotion by international and national authorities.



45 References

1. World Health Organization. *Severe Obesity among Children Aged 6-9 Years*. Copenhagen; 2019. <http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/>.
2. Hawkes C, Smith TG, Jewell J, et al. Smart food policies for obesity prevention. *Lancet*. 2015;385:2410-2421. doi:10.1016/S0140-6736(14)61745-1
3. World Cancer Research Fund International. NOURISHING database.
4. Langlois É V, Daniels K, Akl EA. *Evidence Synthesis for Health Policy and Systems: A Methods Guide*. Geneva; 2018. <https://www.who.int/alliance-hpsr/resources/publications/Alliance-evidence-synthesis-MethodsGuide.pdf>.
5. von Philipsborn P, Stratil JM, Burns J, et al. Environmental interventions to reduce the consumption of sugar-sweetened beverages and their effects on health. *Cochrane Database Syst Rev*. 2019;(6). doi:10.1002/14651858.CD012292.pub2
6. Cecchini M, Sassi F, Lauer JA, Lee YY, Guajardo-Barron V, Chisholm D. Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. *Lancet*. 2010;376(9754):1775-1784. doi:10.1016/S0140-6736(10)61514-0
7. Cecchini M. *The Heavy Burden of Obesity*; Paris: OECD 2019 (in press)
8. *Assessment of the Impact of a Public Health Product Tax*. Budapest; 2016. www.oeti.hu.
9. National Institute for Health Development Hungary. *Impact Assessment of the Hungarian Public Health Product Tax (NETA)*. 2013.
10. Carter R, Moodie M, Markwick A, et al. Assessing Cost-Effectiveness in Obesity (ACE-Obesity): an overview of the ACE approach, economic methods and cost results. *BMC Public Health*. 2009;9(1):419. doi:10.1186/1471-2458-9-419
11. Sacks G, Veerman JL, Moodie M, Swinburn B. 'Traffic-light' nutrition labelling and 'junk-food' tax: a modelled comparison of cost-effectiveness for obesity prevention. *Int J Obes*. 2011;35(7):1001-1009. doi:10.1038/ijo.2010.228
12. World Health Organization. WHO-CHOICE. <https://www.who.int/choice/cost-effectiveness/en/>. 2014.
13. Long MW, Gortmaker SL, Ward ZJ, et al. Cost Effectiveness of a Sugar-Sweetened Beverage Excise Tax in the U.S. *Am J Prev Med*. 2015;49(1):112-123. doi:10.1016/j.amepre.2015.03.004
14. Gortmaker SL, Wang YC, Long MW, et al. Three Interventions That Reduce Childhood Obesity Are Projected To Save More Than They Cost To Implement. *Health Aff*. 2015;34(11):1932-1939. doi:10.1377/hlthaff.2015.0631
15. Lal A, Mantilla-Herrera AM, Veerman L, et al. Modelled health benefits of a sugar-sweetened beverage tax across different socioeconomic groups in Australia: A cost-effectiveness and equity analysis. *PLOS Med*. 2017;14(6). doi:10.1371/journal.pmed.1002326
16. Sugar tax revenue helps tackle childhood obesity. London: HM Treasury 2018. <https://www.gov.uk/government/news/sugar-tax-revenue-helps-tackle-childhood-obesity>
17. Centro de Estudio de las Finanzas Publicas. *Análisis de Los Informes Sobre La Situación Económica, Las Finanzas Públicas y La Deuda Pública Al Cuarto Trimestre de 2014*.



2015. <http://www.cefp.gob.mx/publicaciones/documento/2015/marzo/cefp0032015.pdf>.
18. Silver LD, Ng SW, Ryan-Ibarra S, et al. Changes in prices, sales, consumer spending, and beverage consumption one year after a tax on sugar-sweetened beverages in Berkeley, California, US: A before-and-after study. Langenberg C, ed. *PLOS Med*. 2017;14(4):e1002283. doi:10.1371/journal.pmed.1002283
 19. Powell LM, Wada R, Persky JJ, Chaloupka FJ. Employment impact of sugar-sweetened beverage taxes. *Am J Public Health*. 2014;104(4):672-677. doi:10.2105/AJPH.2013.301630
 20. Guerrero-López CM, Molina M, Colchero MA. Employment changes associated with the introduction of taxes on sugar-sweetened beverages and nonessential energy-dense food in Mexico. *Prev Med (Baltim)*. 2017;105:S43-S49. doi:10.1016/j.ypmed.2017.09.001
 21. Lobstein T, Jackson-Leach R, Moodie ML, et al. Child and adolescent obesity: part of a bigger picture. *Lancet (London, England)*. 2015;385(9986):2510-2520. doi:10.1016/S0140-6736(14)61746-3
 22. Peñalvo JL, Cudhea F, Micha R, et al. The potential impact of food taxes and subsidies on cardiovascular disease and diabetes burden and disparities in the United States. *BMC Med*. 2017;15(1):208. doi:10.1186/s12916-017-0971-9
 23. Sharma A, Hauck K, Hollingsworth B, Siciliani L. The effects of taxing sugar-sweetened beverages across different income groups. *Health Econ*. 2014;23(9):1159-1184. doi:10.1002/hec.3070
 24. Backholer K, Sarink D, Beauchamp A, et al. The impact of a tax on sugar-sweetened beverages according to socio-economic position: a systematic review of the evidence. *Public Health Nutr*. 2016;19(17):3070-3084. doi:10.1017/S136898001600104X
 25. Cabrera Escobar MA, Veerman JL, Tollman SM, Bertram MY, Hofman KJ. Evidence that a tax on sugar sweetened beverages reduces the obesity rate: a meta-analysis. *BMC Public Health*. 2013;13(1):1072. doi:10.1186/1471-2458-13-1072
 26. Smed S, Jensen JD, Denver S. Socio-economic characteristics and the effect of taxation as a health policy instrument. *Food Policy*. 2007;32(5-6):624-639. doi:10.1016/J.FOODPOL.2007.03.002
 27. Bíró A. Did the junk food tax make the Hungarians eat healthier? *Food Policy*. 2015;54:107-115. doi:10.1016/J.FOODPOL.2015.05.003
 28. World Health Organization Regional Office for Europe. *Assessment of the Impact of a Public Health Product Tax*. Budapest; 2015. www.oeti.hu.
 29. Martos É. The Hungarian policies to reduce population sugar intake. *Eur J Public Health*. 2015;25(suppl_3). doi:10.1093/eurpub/ckv173.058
 30. *Health Equity Pilot Project (HEPP) The Impact of Taxes on "junk Food" in Hungary - Case Study*. 2017. https://ec.europa.eu/health/sites/health/files/social_determinants/docs/hepp_case-studies_02_en.pdf.
 31. Ng SW, Rivera JA, Popkin BM, Colchero MA. Did high sugar-sweetened beverage purchasers respond differently to the excise tax on sugar-sweetened beverages in Mexico? *Public Health Nutr*. 2019;22(4):750-756. doi:10.1017/S136898001800321X
 32. Taillie LS, Rivera JA, Popkin BM, Batis C. Do high vs. low purchasers respond differently to a nonessential energy-dense food tax? Two-year evaluation of Mexico's 8% nonessential food tax. *Prev Med (Baltim)*. 2017;105:S37-S42.



doi:10.1016/j.ypped.2017.07.009

33. Colchero MA, Popkin BM, Rivera JA, Ng SW. Beverage purchases from stores in Mexico under the excise tax on sugar sweetened beverages: observational study. *BMJ*. 2016;352:h6704. doi:10.1136/bmj.h6704
34. ELLS LJ, Roberts K, McGowan VJ, Machaira T. *Sugar Reduction: The Evidence for Action. Annexe 2: A Mixed Method Review of Behaviour Changes Resulting from Experimental Studies That Examine the Effect of Fiscal Measures Targeted at High Sugar Food and Non-Alcoholic Drink*. 2015. www.gov.uk/phe.
35. *Fiscal Policies for Diet and the Prevention of Noncommunicable Diseases*. 2016. <https://www.who.int/dietphysicalactivity/publications/fiscal-policies-diet-prevention/en/>.
36. Colchero MA, Rivera-Dommarco J, Popkin BM, Ng SW. In Mexico, Evidence Of Sustained Consumer Response Two Years After Implementing A Sugar-Sweetened Beverage Tax. *Health Aff*. 2017;36(3):564-571. doi:10.1377/hlthaff.2016.1231
37. McMillan SJ. Food and nutrition policy issues in remote Aboriginal communities: lessons from Arnhem Land. *Aust J Public Health*. 2010;15(4):281-285. doi:10.1111/j.1753-6405.1991.tb00348.x
38. Lee A, Lewis M. Testing the Price of Healthy and Current Diets in Remote Aboriginal Communities to Improve Food Security: Development of the Aboriginal and Torres Strait Islander Healthy Diets ASAP (Australian Standardised Affordability and Pricing) Methods. *Int J Environ Res Public Health*. 2018;15(12):2912. doi:10.3390/ijerph15122912
39. Wright A, Smith KE, Hellowell M. Policy lessons from health taxes: a systematic review of empirical studies. *BMC Public Health*. 2017;17(1):583. doi:10.1186/s12889-017-4497-z
40. Rathbone Greenbank Investments. The UK sugar tax: one year on. 2019. <https://www.rathbonegreenbank.com/insight/uk-sugar-tax-one-year>.
41. Bosire EN, Stacey N, Mukoma G, Tugendhaft A, Hofman K, Norris SA. Attitudes and perceptions among urban South Africans towards sugar-sweetened beverages and taxation. *Public Health Nutr*. 2019:1-10. doi:10.1017/S1368980019001356
42. Signal LN, Watts C, Murphy C, Eyles H, Ni Mhurchu C. Appetite for health-related food taxes: New Zealand stakeholder views. *Health Promot Int*. 2018;33(5):791-800. doi:10.1093/heapro/dax019
43. Sundborn G, Thornley S, Baeglehole R, Bezzant N. Policy brief: a sugary drink tax for New Zealand and 10,000-strong petition snubbed by Minister of Health and National Government. *N Z Med J*. 2017;130(1462). <https://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2017/vol-130-no-1462-22-september-2017/7370>.
44. Street JM, Sisnowski J, Tooher R, Farrell LC, Braunack-Mayer AJ. Community perspectives on the use of regulation and law for obesity prevention in children: A citizens' jury. *Health Policy (New York)*. 2017;121(5):566-573. doi:10.1016/j.healthpol.2017.03.001
45. Moretto N, Kendall E, Whitty J, et al. Yes, The Government Should Tax Soft Drinks: Findings from a Citizens' Jury in Australia. *Int J Environ Res Public Health*. 2014;11(3):2456-2471. doi:10.3390/ijerph110302456
46. Donaldson EA, Cohen JE, Rutkow L, Villanti AC, Kanarek NF, Barry CL. Public support for a sugar-sweetened beverage tax and pro-tax messages in a Mid-Atlantic US state. *Public Health Nutr*. 2015;18(12):2263-73.
47. Jou J, Niederdeppe J, Barry CL, Gollust SE. Strategic Messaging to Promote Taxation of Sugar-Sweetened Beverages: Lessons From Recent Political Campaigns. *Am J Public*



- Health*. 2014;104(5):847-853. doi:10.2105/AJPH.2013.301679
48. Tamir O, Cohen-Yogev T, Furman-Assaf S, Endevelt R. Taxation of sugar sweetened beverages and unhealthy foods: a qualitative study of key opinion leaders' views. *Isr J Health Policy Res*. 2018;7(1):43. doi:10.1186/s13584-018-0240-1
 49. Thomas-Meyer M, Mytton O, Adams J. Public responses to proposals for a tax on sugar-sweetened beverages: A thematic analysis of online reader comments posted on major UK news websites. *PLoS One*. 2017;12(11).
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0186750>.
 50. Barry CL, Niederdeppe J, Gollust SE. Taxes on Sugar-Sweetened Beverages. *Am J Prev Med*. 2013;44(2):158-163. doi:10.1016/j.amepre.2012.09.065
 51. World Health Organization. *Report of the Commission on Ending Childhood Obesity*. Geneva; 2016.
https://apps.who.int/iris/bitstream/handle/10665/204176/9789241510066_eng.pdf;jsessionid=F4D88BFF8B024D8CB866CD3932D1F308?sequence=1.
 52. Bødker M, Pisinger C, Toft U, Jørgensen T. The rise and fall of the world's first fat tax. *Health Policy (New York)*. 2015;119(6):737-742. doi:10.1016/j.healthpol.2015.03.003
 53. HM Revenue & Customs. *Soft Drinks Industry Levy. Summary of Responses*.; 2016.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/575828/Soft_Drinks_Industry_Levy_-_summary_of_responses.pdf.
 54. Myers A, Fig D, Tugendhaft A, Mandle J, Myers J, Hofman K. Sugar and health in South Africa: Potential challenges to leveraging policy change. *Glob Public Health*. 2017;12(1):98-115. doi:10.1080/17441692.2015.1071419
 55. Vallgård S, Holm L, Jensen JD. The Danish tax on saturated fat: why it did not survive. *Eur J Clin Nutr*. 2015;69(2):223-226. doi:10.1038/ejcn.2014.224
 56. Massive treat-y: 10 health organisations join call for sugar tax. Rethink sugary drink. 2017.
<http://www.rethinksugarydrink.org.au/media/health-organisations-join-call-for-sugar-tax.html>.
 57. Jamieoliver.com. What is the Soft Drinks Industry Levy (sugar tax)? Campaigns, Nutrition. 2018. <https://www.jamieoliver.com/features/soft-drinks-industry-levy/>.
 58. The Food Foundation. *The UK's Sugar Levy*.; 2017. https://foodfoundation.org.uk/wp-content/uploads/2017/07/2-Briefing-Sugar-Levy_vF.pdf.
 59. Taber DR, Dulin-Keita A, Fallon M, et al. Society of Behavioral Medicine (SBM) position statement: Enact taxes on sugar sweetened beverages to prevent chronic disease. *Transl Behav Med*. 2019;9(1):179-183. doi:10.1093/tbm/iby035
 60. Taxation and Sugar-Sweetened Beverages: Position of Dietitians of Canada. *Can J Diet Pract Res*. 2016;77(2):110-110. doi:10.3148/cjdp-2016-008
 61. British Medical Association. *Food for Thought: Promoting Healthy Diets among Children and Young People*. 2015.
 62. Barber S, Baker C, Foster D. *The Soft Drinks Industry Levy*. 2017.
 63. Buckton CH, Patterson C, Hyseni L, et al. The palatability of sugar-sweetened beverage taxation: A content analysis of newspaper coverage of the UK sugar debate. de Souza RJ, ed. *PLoS One*. 2018;13(12):e0207576. doi:10.1371/journal.pone.0207576
 64. Milward-Brown. *How Has Awareness, Comprehension and Usage of GDA Labelling*



- Evolved?* 2008. http://www.fdf.org.uk/publicgeneral/MillwardBrown_research_Sep08.pdf.
65. Food Standards Agency. *Front of Pack (FOP) Nutrition Labelling*. 2007. <https://www.food.gov.uk/sites/default/files/multimedia/pdfs/board/fsa100307.pdf>.
 66. Stockley R, Jordan E, Hunter A. *Citizens' Forums on Food: Front of Pack (FoP) Nutrition Labelling Prepared for: Food Standards Agency*. 2010. <https://webarchive.nationalarchives.gov.uk/20100929125556/http://www.food.gov.uk/multimedia/pdfs/citforumfop.pdf>.
 67. Department for Business I& S. 2011 skills for life survey. UK Government. 2012. <https://www.gov.uk/government/publications/2011-skills-for-life-survey>.
 68. Sacks G, Rayner M, Swinburn B. Impact of front-of-pack "traffic-light" nutrition labelling on consumer food purchases in the UK. *Health Promot Int*. 2009;24(4):344-352. doi:10.1093/heapro/dap032
 69. Crosetto P, Lacroix A, Muller L, Ruffieux B. Modification des achats alimentaires en réponse à cinq logos nutritionnels. *Cah Nutr Diététique*. 2017;52(3):129-133. doi:10.1016/J.CND.2017.04.002
 70. Ducrot P, Méjean C, Julia C, et al. Objective Understanding of Front-of-Package Nutrition Labels among Nutritionally At-Risk Individuals. *Nutrients*. 2015;7(8):7106-7125. doi:10.3390/nu7085325
 71. Méjean C, Macouillard P, Péneau S, Hercberg S, Castetbon K. Perception of front-of-pack labels according to social characteristics, nutritional knowledge and food purchasing habits. *Public Health Nutr*. 2013;16(3):392-402. doi:10.1017/S1368980012003515
 72. Michail N. 5-C NutriScore to be France's official nutrition label. Food Navigator. 2017. <https://www.foodnavigator.com/Article/2017/03/16/5-C-NutriScore-to-be-France-s-official-nutrition-label>.
 73. Malloy-Weir L, Cooper M. Health literacy, literacy, numeracy and nutrition label understanding and use: a scoping review of the literature. *J Hum Nutr Diet*. 2017;30(3):309-325. doi:10.1111/jhn.12428
 74. Vyth EL, Steenhuis IH, Roodenburg AJ, Brug J, Seidell JC. Front-of-pack nutrition label stimulates healthier product development: a quantitative analysis. *Int J Behav Nutr Phys Act*. 2010;7(1):65. doi:10.1186/1479-5868-7-65
 75. Kanter R, Reyes M, Vandevijvere S, Swinburn B, Corvalán C. Anticipatory effects of the implementation of the Chilean Law of Food Labeling and Advertising on food and beverage product reformulation. *Obes Rev*. 2019. doi:10.1111/obr.12870
 76. Petition on European food labels seeks 1m signatures. *The Connexion*. 2019. <https://www.connexionfrance.com/French-news/Pro-Nutri-Score-petition-on-European-food-labels-seeks-1m-signatures>.
 77. Bhawra J, Reid JL, White CM, Vanderlee L, Raine K, Hammond D. Are young Canadians supportive of proposed nutrition policies and regulations? An overview of policy support and the impact of socio-demographic factors on public opinion. *Can J Public Heal*. 2018;109(4):498-505. doi:10.17269/s41997-018-0066-1
 78. Comans T, Moretto N, Byrnes J. Public Preferences for the Use of Taxation and Labelling Policy Measures to Combat Obesity in Young Children in Australia. *Int J Environ Res Public Health*. 2017;14(3):324. doi:10.3390/ijerph14030324
 79. *Global Nutrition Policy Review 2016-2017*. Geneva; 2018. <https://apps.who.int/iris/bitstream/handle/10665/275990/9789241514873-eng.pdf?ua=1>.



80. Italy to fight food traffic light system (3). ANSA. 2017. http://www.ansa.it/english/news/lifestyle/food_wine/2017/03/08/italy-to-fight-food-traffic-light-system-3_d1cee032-20b8-4340-bfde-bd208b4e5658.html.
81. Michail N. Italy raises red flag once more over UK's traffic light label. Food Navigator. 2016. <https://www.foodnavigator.com/Article/2016/03/16/Italy-raises-red-flag-once-more-over-UK-s-traffic-light-label>.
82. European Union Comments on Agenda Item 6: PROPOSED DRAFT GUIDELINES ON FRONT-OF-PACK NUTRITION LABELLING (Comments at Step 3 - CL 2019/14/OCS-FL). (para 3.2) https://ec.europa.eu/food/sites/food/files/safety/docs/codex_ccfl_45_agenda-item-06.pdf.
83. Front of Pack Labelling. Policy Position. Food & drink federation. <http://www.fdf.org.uk/keyissues.aspx?issue=636>.
84. Schulz F. No colour-coded Nutri-Score for Nestlé in Germany. Euractiv.de. 2019. <https://www.euractiv.com/section/agriculture-food/news/no-colour-coded-nutriscore-for-nestle-in-germany/>.
85. Rixon P. New Italian body set up to fight traffic light labelling. IEG Policy. 2017. <https://iegpolicy.agribusinessintelligence.informa.com/PL213331/New-Italian-body-set-up-to-fight-traffic-light-labelling>.
86. Nutella threatened by EU label laws, Italian claim. The Telegraph. 2010. <https://www.telegraph.co.uk/foodanddrink/foodanddrinknews/7836423/Nutella-threatened-by-EU-label-laws-Italians-claim.html>.
87. FoodDrinkEurope 2017. Comments from FoodDrinkEurope CODEX COMMITTEE ON FOOD LABELLING Forty-fourth Session Asunción, Paraguay, 16-20 October 2017. http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcode-x%252FMeetings%252FCX-714-44%252FCRDs%252Ffl44_crd18.pdf.
88. Campbell D. All supermarkets to adopt "traffic-light labelling" for nutrition. The Guardian. 2012. <https://www.theguardian.com/business/2012/oct/24/supermarkets-traffic-light-labelling-nutrition>.
89. McDonald A. Market leaders Migros and Coop are against the traffic light view. Kxan36. 2019. <https://www.kxan36news.com/market-leaders-migros-and-coop-are-against-the-food-traffic-light-view>.
90. European Commission Consultation. *Labelling: Competitiveness, Consumer Information and Better Regulation for the EU*. https://ec.europa.eu/food/sites/food/files/safety/docs/labelling-nutrition_better-reg_indiv-resp_153.pdf.
91. Codex committee started negotiations on front-of-pack nutrition labelling. Consumers International. 2019. <https://www.consumersinternational.org/news-resources/news/releases/codex-committee-started-negotiations-on-front-of-pack-nutrition-labelling/>.
92. *Joint Response to UK Consultation on Front of Pack Nutrition Labelling*. https://www.cancerresearchuk.org/sites/default/files/joint_response_to_uk_fop_consultation_final.pdf.
93. BMRB Social Research, Food, Consumer B and HRC at the U of S. *Comprehension and Use of UK Nutrition Signpost Labelling Schemes*. 2008. <https://webarchive.nationalarchives.gov.uk/20120403230459/http://www.food.gov.uk/multi>



media/pdfs/quantrationale.pdf.

94. Lobstein T, Landon J, Lincoln P. *The Problems with Guideline Daily Amounts (GDAs). A Review of GDAs and Their Use for Signalling Nutritional Information on Food and Drink Labels*. London; 2007. <https://studyres.com/doc/17781795/misconceptions-and-misinformation--the-problems-with-gdas>.
95. Thow AM, Jones A, Schneider CH, Labonté R. Global Governance of Front-of-Pack Nutrition Labelling: A Qualitative Analysis. *Nutrients*. 2019;11(2). doi:10.3390/nu11020268
96. *European Food and Nutrition Action Plan 2015-2020*. Copenhagen; 2014. <http://www.euro.who.int/en/publications/abstracts/european-food-and-nutrition-action-plan-20152020-2014>
97. Nutrient Profiling. WHO. <https://www.who.int/nutrition/topics/profiling/en/>.
98. Kanter R, Vanderlee L, Vandevijvere S. Front-of-package nutrition labelling policy: global progress and future directions. *Public Health Nutr*. 2018;21(8):1399-1408. doi:10.1017/S1368980018000010
99. Hercberg S, Chantal J. Front-of-pack labels: why are certain agro-industrial firms resisting? *The Conversation*. 2017. <https://theconversation.com/front-of-pack-nutrition-labels-why-are-certain-agro-industrial-firms-resisting-87975>.
100. Nestlé. Nestlé announces support for Nutri-Score in Continental Europe. 2019. <https://www.nestle.com/asset-library/documents/media/nestle-supports-nutri-score-in-continental-europe-june-2019.pdf>.
101. Brown V, Ananthapavan J, Veerman L, et al. The Potential Cost-Effectiveness and Equity Impacts of Restricting Television Advertising of Unhealthy Food and Beverages to Australian Children. *Nutrients*. 2018;10(5):622. doi:10.3390/nu10050622
102. *Tackling Food Marketing to Children in a Digital World: Trans-Disciplinary Perspectives. Children's Rights, Evidence of Impact, Methodological Challenges, Regulatory Options and Policy Implications for the WHO European Region*. Copenhagen; 2016. <http://www.euro.who.int/pubrequest>.
103. *Monitoring and Restricting Digital Marketing of Unhealthy Products to Children and Adolescents*. Moscow; 2018. http://www.euro.who.int/__data/assets/pdf_file/0008/396764/Online-version_Digital-Mktg_March2019.pdf.
104. Garde A, Byrne S, Gokani N, Murphy B. *A Child Rights-Based Approach to Food Marketing: A Guide for Policy Makers*. 2018. www.unicef.org/csr.
105. *Set of Recommendations on the Marketing of Foods and Non-Alcoholic Beverages to Children*. Geneva; 2010. https://apps.who.int/iris/bitstream/handle/10665/44416/9789241500210_eng.pdf?sequence=1.
106. *International Code of Marketing of Breast-Milk Substitutes*. Geneva; 1981. <https://apps.who.int/iris/bitstream/handle/10665/40382/9241541601.pdf?sequence=1>.
107. *Guidance on Ending the Inappropriate Promotion of Foods for Infants and Young Children. Implementation Manual*. Geneva; 2017. <https://apps.who.int/iris/bitstream/handle/10665/260137/9789241513470-eng.pdf>.
108. World Health Organization Regional Office for Europe. *Commercial Foods for Infants and Young Children in the WHO European Region*. Copenhagen; 2019. <http://www.euro.who.int/pubrequest>.



109. Lupiáñez-Villanueva F, Gaskell G, Veltri G, et al. *Study on the Impact of Marketing through Social Media, Online Games and Mobile Applications on Children's Behaviour. Final Report*. Brussels; 2016.
https://ec.europa.eu/info/sites/info/files/online_marketing_children_final_report_en.pdf..
110. Ells LJ, Roberts K, MCGowan VJ, Machaira T. *Sugar Reduction: The Evidence for Action. Annexe 3: A Mixed Method Review of Behaviour Changes Resulting from Marketing Strategies Targeted at High Sugar Food and Non-Alcoholic Drink.*; 2015.
www.gov.uk/phe.
111. Adams J, Tyrrell R, Adamson AJ, White M. Socio-economic differences in exposure to television food advertisements in the UK: a cross-sectional study of advertisements broadcast in one television region. *Public Health Nutr.* 2012;15(3):487-494.
doi:10.1017/S1368980011001686
112. Harris JL, Schwartz MB, Brownell KD, et al. *Evaluating Fast Food Nutrition and Marketing to Youth Fast Food FACTS: Evaluating Fast Food Nutrition and Marketing to Youth*. 2010.
http://fastfoodmarketing.org/media/FastFoodFACTS_Report_2010.pdf.
113. Zimmerman FJ, Shimoga S V. The effects of food advertising and cognitive load on food choices. *BMC Public Health.* 2014;14(1):342. doi:10.1186/1471-2458-14-342
114. Klepp K-I, Wind M, de Bourdeaudhuij I, et al. Television viewing and exposure to food-related commercials among European school children, associations with fruit and vegetable intake: a cross sectional study. *Int J Behav Nutr Phys Act.* 2007;4:46.
doi:10.1186/1479-5868-4-46
115. Vereecken CA, Todd J, Roberts C, Mulvihill C, Maes L. Television viewing behaviour and associations with food habits in different countries. *Public Health Nutr.* 2006;9(2):244-250.
<http://www.ncbi.nlm.nih.gov/pubmed/16571179>.
116. Donohue TR, Meyer TP, Henke LL. Black and White Children: Perceptions of TV Commercials. *J Mark.* 1978;42(4):34. doi:10.2307/1250083
117. Mills SDH, Tanner LM, Adams J. Systematic literature review of the effects of food and drink advertising on food and drink-related behaviour, attitudes and beliefs in adult populations. *Obes Rev.* 2013;14(4):303-314. doi:10.1111/obr.12012
118. Boyland EJ, Nolan S, Kelly B, et al. Advertising as a cue to consume: a systematic review and meta-analysis of the effects of acute exposure to unhealthy food and nonalcoholic beverage advertising on intake in children and adults. *Am J Clin Nutr.* 2016;103(2):519-533. doi:10.3945/ajcn.115.120022
119. Kim KH, Kang E, Yun YH. Public support for health taxes and media regulation of harmful products in South Korea. *BMC Public Health.* 2019;19(1):665. doi:10.1186/s12889-019-7044-2
120. Tripicchio G, Heo M, Diewald L, et al. Restricting Advertisements for High-Fat, High-Sugar Foods during Children's Television Programs: Attitudes in a US Population-Based Sample. *Child Obes.* 2016;12(2):113-118. doi:10.1089/chi.2015.0174
121. Suggs LS, McIntyre C. European Union public opinion on policy measures to address childhood overweight and obesity. *J Public Health Policy.* 2011;32(1):91-106.
doi:10.1057/jphp.2010.44
122. Dorfman L, Wallack L, Woodruff K. More than a message: framing public health advocacy to change corporate practices. *Heal Educ Behav.* 2005;32(3):320-336.
doi:10.1177/1090198105275046



123. Théodore F, Juárez-Ramírez C, Cahuana-Hurtado L, Blanco I, Tolentino-Mayo L, Bonvecchio A. [Barriers and opportunities for the regulation of food and beverage advertising to children in Mexico]. *Salud Publica Mex.* 2014;56 Suppl 2:s123-9. <http://www.ncbi.nlm.nih.gov/pubmed/25629244>.
124. Public Health England. *Sugar Reduction The Evidence for Action*. London; 2015.
125. Responsible marketing. International Food & Beverage Alliance. <https://ifballiance.org/commitments/responsible-marketing-to-children>.
126. EU Pledge. <https://eu-pledge.eu/>.
127. Children's Food and Beverage Advertising Initiative (CFBAI). BBB National Programs, Inc. <https://bbbprograms.org/programs/CFBAI/>.
128. Our response on publication of the government consultation on food advertising restrictions. Advertising Association. 2019. <https://www.adassoc.org.uk/policy-areas/advertising-association-response-on-publication-of-the-government-consultation-on-food-advertising-restrictions/>.
129. *The Challenge of Childhood Obesity: The Advertising Industry's Perspective*. 2019. <https://www.adassoc.org.uk/wp-content/uploads/2019/03/Advertising-Association-report-The-challenge-of-childhood-obesity-1.pdf>.
130. Obesity Health Alliance. Protect children from all junk food advertising, say health experts - and parents agree. 2019. <http://obesityhealthalliance.org.uk/2019/02/28/protect-children-junk-food-advertising-say-health-experts-parents-agree/>.
131. Consumers International, World Obesity Federation. *Recommendations towards a Global Convention to Protect and Promote Healthy Diets*. 2014. <https://www.consumersinternational.org/media/2211/recommendations-for-a-convention-on-healthy-diets-low-res-for-web.pdf>.
132. IASO, Consumers International, International Obesity Taskforce. *Recommendations for an International Code on Marketing of Foods and Non-Alcoholic Beverages to Children*. 2008. www.iotf.org/sydneyprinciples.
133. Swinburn B, Sacks G, Lobstein T, et al. Sydney Principles' for reducing the commercial promotion of foods and beverages to children. *Public Health Nutr.* 2008;11(9):881-886. doi:10.1017/S136898000800284X
134. *FACTS. Unhealthy and Unregulated Food Advertising and Marketing to Children.*; 2014. <http://www.childhealthdata.org/learn/NSCH>.
135. BMA briefing: Childhood obesity. BMA. 2018. <https://www.bma.org.uk/collective-voice/influence/uk-governments/westminster/briefings/childhood-obesity>.
136. Brinsden H, Neveux M. *Digital Marketing of Food: Considerations for European Policymakers*. London; 2018. <https://www.worldobesity.org/resources/policy-dossiers/pd-2>.
137. Bösch S, Lobstein T, Brinsden H, et al. *Taking Action on Childhood Obesity*. 2018. <https://apps.who.int/iris/bitstream/handle/10665/274792/WHO-NMH-PND-ECHO-18.1-eng.pdf?ua=1>.
138. *Obesity Update 2017*. 2017. www.oecd.org/health/obesity-update.htm.
139. Evidence from UK supermarkets Sainsbury and ASDA to House of Lords Science and Technology Committee inquiry into Behaviour Change (2011).



Funded by the Horizon 2020
Framework Programme
of the European Union
GA: 774548



<https://www.parliament.uk/business/committees/committees-a-z/lords-select/science-and-technology-committee/inquiries/behaviour/>



46 Annex

Search strategy

Search terms for the Medline (PubMed) search are shown here:

Medline definitions

nutrition	"nutritional status"[MeSH Terms] OR ("nutritional"[All Fields] AND "status"[All Fields]) OR "nutritional status"[All Fields] OR "nutrition"[All Fields] OR "nutritional sciences"[MeSH Terms] OR ("nutritional"[All Fields] AND "sciences"[All Fields]) OR "nutritional sciences"[All Fields]
food	"food"[MeSH Terms] OR "food"[All Fields]
beverages	"beverages"[MeSH Terms] OR "beverages"[All Fields]
cost	"economics"[Subheading] OR "economics"[All Fields] OR "cost"[All Fields] OR "costs and cost analysis"[MeSH Terms] OR ("costs"[All Fields] AND "cost"[All Fields] AND "analysis"[All Fields]) OR "costs and cost analysis"[All Fields]
cost-benefit	"cost-benefit analysis"[MeSH Terms] OR ("cost-benefit"[All Fields] AND "analysis"[All Fields]) OR "cost-benefit analysis"[All Fields] OR ("cost"[All Fields] AND "benefit"[All Fields]) OR "cost benefit"[All Fields]
resource	"health resources"[MeSH Terms] OR ("health"[All Fields] AND "resources"[All Fields]) OR "health resources"[All Fields] OR "resource"[All Fields]
inequality	"socioeconomic factors"[MeSH Terms] OR ("socioeconomic"[All Fields] AND "factors"[All Fields]) OR "socioeconomic factors"[All Fields] OR "inequality"[All Fields]
education	"education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]
literacy	"literacy"[MeSH Terms] OR "literacy"[All Fields]
marketing	"marketing"[MeSH Terms] OR "marketing"[All Fields]

Fiscal measures (435 results)

(fiscal[All Fields] OR tax[All Fields] OR ("taxes"[MeSH Terms] OR "taxes"[All Fields] OR "taxation"[All Fields])) AND (((("food"[MeSH Terms] OR "food"[All Fields]) OR ("beverages"[MeSH Terms] OR "beverages"[All Fields]))) AND (("economics"[Subheading] OR "economics"[All Fields] OR "cost"[All Fields] OR "costs and cost analysis"[MeSH Terms] OR ("costs"[All Fields] AND "cost"[All Fields] AND "analysis"[All Fields]) OR "costs and cost analysis"[All Fields]) OR ("cost-benefit analysis"[MeSH Terms] OR ("cost-benefit"[All Fields] AND "analysis"[All Fields]) OR "cost-benefit analysis"[All Fields] OR ("cost"[All Fields] AND "benefit"[All Fields]) OR "cost benefit"[All Fields]) OR ("health resources"[MeSH Terms] OR ("health"[All Fields] AND "resources"[All Fields]) OR "health



resources"[All Fields] OR "resource"[All Fields])) AND (("socioeconomic factors"[MeSH Terms] OR ("socioeconomic"[All Fields] AND "factors"[All Fields]) OR "socioeconomic factors"[All Fields] OR "inequality"[All Fields]) OR disparity[All Fields] OR ("education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]) OR socio-economic[All Fields] OR ("literacy"[MeSH Terms] OR "literacy"[All Fields]))))

Nutrition labelling (290 results)

("food labeling"[MeSH Terms] OR ("food"[All Fields] AND "labeling"[All Fields]) OR "food labeling"[All Fields] OR ("nutrition"[All Fields] AND "label"[All Fields]) OR "nutrition label"[All Fields]) AND (((("food"[MeSH Terms] OR "food"[All Fields]) OR ("beverages"[MeSH Terms] OR "beverages"[All Fields])) AND (("economics"[Subheading] OR "economics"[All Fields] OR "cost"[All Fields] OR "costs and cost analysis"[MeSH Terms] OR ("costs"[All Fields] AND "cost"[All Fields] AND "analysis"[All Fields]) OR "costs and cost analysis"[All Fields]) OR ("cost-benefit analysis"[MeSH Terms] OR ("cost-benefit"[All Fields] AND "analysis"[All Fields]) OR "cost-benefit analysis"[All Fields] OR ("cost"[All Fields] AND "benefit"[All Fields]) OR "cost benefit"[All Fields]) OR ("health resources"[MeSH Terms] OR ("health"[All Fields] AND "resources"[All Fields]) OR "health resources"[All Fields] OR "resource"[All Fields])) AND (("socioeconomic factors"[MeSH Terms] OR ("socioeconomic"[All Fields] AND "factors"[All Fields]) OR "socioeconomic factors"[All Fields] OR "inequality"[All Fields]) OR disparity[All Fields] OR ("education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]) OR socio-economic[All Fields] OR ("literacy"[MeSH Terms] OR "literacy"[All Fields]))))

Marketing to children (156 results)

((("marketing"[MeSH Terms] OR "marketing"[All Fields]) OR ("advertising as topic"[MeSH Terms] OR ("advertising"[All Fields] AND "topic"[All Fields]) OR "advertising as topic"[All Fields] OR "advertising"[All Fields]) OR commercials[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields])) AND (((("food"[MeSH Terms] OR "food"[All Fields]) OR ("beverages"[MeSH Terms] OR "beverages"[All Fields])) AND (("economics"[Subheading] OR "economics"[All Fields] OR "cost"[All Fields] OR "costs and cost analysis"[MeSH Terms] OR ("costs"[All Fields] AND "cost"[All Fields] AND "analysis"[All Fields]) OR "costs and cost analysis"[All Fields]) OR ("cost-benefit analysis"[MeSH Terms] OR ("cost-benefit"[All Fields] AND "analysis"[All Fields]) OR "cost-benefit analysis"[All Fields] OR ("cost"[All Fields] AND "benefit"[All Fields]) OR "cost benefit"[All Fields]) OR ("health resources"[MeSH Terms] OR ("health"[All Fields] AND "resources"[All Fields]) OR "health resources"[All Fields] OR "resource"[All Fields])) AND (("socioeconomic factors"[MeSH Terms] OR ("socioeconomic"[All Fields] AND "factors"[All Fields]) OR "socioeconomic factors"[All Fields] OR "inequality"[All Fields]) OR disparity[All Fields] OR ("education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH



Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]) OR socio-economic[All Fields] OR ("literacy"[MeSH Terms] OR "literacy"[All Fields]))

Google Scholar and Google

((marketing OR advertising OR commercials) AND child) AND (food OR beverages) AND (cost OR cost-benefit OR resource) AND (inequality OR disparity OR education OR socio-economic OR literacy)

(fiscal OR tax) AND (food OR beverages) AND (cost OR cost-benefit OR resource) AND (inequality OR disparity OR education OR socio-economic OR literacy)

(nutrition AND labelling) AND (food OR beverages) AND (cost OR cost-benefit OR resource) AND (inequality OR disparity OR education OR socio-economic OR literacy)



Table of included studies in the systematic review

Fiscal interventions	
Costs and resources	
Reference no	Cecchini M, Sassi F, Lauer JA, Lee YY, Guajardo-Barron V, Chisholm D. Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. <i>Lancet</i> . 2010;376(9754):1775-1784. doi:10.1016/S0140-6736(10)61514-0
6.	
7.	Cecchini M. <i>The Heavy Burden of Obesity</i> .; 2019.
8.	<i>Assessment of the Impact of a Public Health Product Tax</i> . Budapest; 2016. www.oeti.hu.
9.	National Institute for Health Development Hungary. <i>Impact Assessment of the Hungarian Public Health Product Tax (NETA)</i> . 2013.
10.	Carter R, Moodie M, Markwick A, et al. Assessing Cost-Effectiveness in Obesity (ACE-Obesity): an overview of the ACE approach, economic methods and cost results. <i>BMC Public Health</i> . 2009;9(1):419. doi:10.1186/1471-2458-9-419
11.	Sacks G, Veerman JL, Moodie M, Swinburn B. 'Traffic-light' nutrition labelling and 'junk-food' tax: a modelled comparison of cost-effectiveness for obesity prevention. <i>Int J Obes</i> . 2011;35(7):1001-1009. doi:10.1038/ijo.2010.228
12.	World Health Organization. WHO-CHOICE. https://www.who.int/choice/cost-effectiveness/en/ . 2014.
13.	Long MW, Gortmaker SL, Ward ZJ, et al. Cost Effectiveness of a Sugar-Sweetened Beverage Excise Tax in the U.S. <i>Am J Prev Med</i> . 2015;49(1):112-123. doi:10.1016/j.amepre.2015.03.004
14.	Gortmaker SL, Wang YC, Long MW, et al. Three Interventions That Reduce Childhood Obesity Are Projected To Save More Than They Cost To Implement. <i>Health Aff</i> . 2015;34(11):1932-1939. doi:10.1377/hlthaff.2015.0631
15.	Lal A, Mantilla-Herrera AM, Veerman L, et al. Modelled health benefits of a sugar-sweetened beverage tax across different socioeconomic groups in Australia: A cost-effectiveness and equity analysis. <i>PLOS Med</i> . 2017;14(6). doi:10.1371/journal.pmed.1002326
16.	Sugar tax on soft drinks raises £154m. BBC News. 2018 https://www.bbc.co.uk/news/business-46279224 .
17.	Centro de Estudio de las Finanzas Publicas. <i>Análisis de Los Informes Sobre La Situación Económica, Las Finanzas Públicas y La Deuda Pública Al Cuarto Trimestre de 2014</i> . 2015. http://www.cefp.gob.mx/publicaciones/documento/2015/marzo/cefp0032015.pdf .
18.	Silver LD, Ng SW, Ryan-Ibarra S, et al. Changes in prices, sales, consumer spending, and beverage consumption one year after a tax on sugar-sweetened beverages in Berkeley, California, US: A before-and-after study. Langenberg C, ed. <i>PLOS Med</i> . 2017;14(4):e1002283. doi:10.1371/journal.pmed.1002283
19.	Powell LM, Wada R, Persky JJ, Chaloupka FJ. Employment impact of sugar-sweetened beverage taxes. <i>Am J Public Health</i> . 2014;104(4):672-677. doi:10.2105/AJPH.2013.301630
20.	Guerrero-López CM, Molina M, Colchero MA. Employment changes associated with the introduction of taxes on sugar-sweetened beverages and nonessential energy-dense food in Mexico. <i>Prev Med (Baltim)</i> . 2017;105:S43-S49. doi:10.1016/j.ypmed.2017.09.001
21.	Lobstein T, Jackson-Leach R, Moodie ML, et al. Child and adolescent obesity: part of a bigger picture. <i>Lancet (London, England)</i> . 2015;385(9986):2510-2520. doi:10.1016/S0140-6736(14)61746-3



Equity and human rights	
9.	National Institute for Health Development Hungary. <i>Impact Assessment of the Hungarian Public Health Product Tax (NETA)</i> . 2013.
15.	Lal A, Mantilla-Herrera AM, Veerman L, et al. Modelled health benefits of a sugar-sweetened beverage tax across different socioeconomic groups in Australia: A cost-effectiveness and equity analysis. <i>PLOS Med</i> . 2017;14(6). doi:10.1371/journal.pmed.1002326
22.	Peñalvo JL, Cudhea F, Micha R, et al. The potential impact of food taxes and subsidies on cardiovascular disease and diabetes burden and disparities in the United States. <i>BMC Med</i> . 2017;15(1):208. doi:10.1186/s12916-017-0971-9
23.	Sharma A, Hauck K, Hollingsworth B, Siciliani L. The effects of taxing sugar-sweetened beverages across different income groups. <i>Health Econ</i> . 2014;23(9):1159-1184. doi:10.1002/hec.3070
24.	Backholer K, Sarink D, Beauchamp A, et al. The impact of a tax on sugar-sweetened beverages according to socio-economic position: a systematic review of the evidence. <i>Public Health Nutr</i> . 2016;19(17):3070-3084. doi:10.1017/S136898001600104X
25.	Cabrera Escobar MA, Veerman JL, Tollman SM, Bertram MY, Hofman KJ. Evidence that a tax on sugar sweetened beverages reduces the obesity rate: a meta-analysis. <i>BMC Public Health</i> . 2013;13(1):1072. doi:10.1186/1471-2458-13-1072
26.	Smed S, Jensen JD, Denver S. Socio-economic characteristics and the effect of taxation as a health policy instrument. <i>Food Policy</i> . 2007;32(5-6):624-639. doi:10.1016/J.FOODPOL.2007.03.002
27.	Bíró A. Did the junk food tax make the Hungarians eat healthier? <i>Food Policy</i> . 2015;54:107-115. doi:10.1016/J.FOODPOL.2015.05.003
28.	World Health Organization Regional Office for Europe. <i>Assessment of the Impact of a Public Health Product Tax</i> . Budapest; 2015. www.oeti.hu.
29.	Martos É. The Hungarian policies to reduce population sugar intake. <i>Eur J Public Health</i> . 2015;25(suppl_3). doi:10.1093/eurpub/ckv173.058
30.	<i>Health Equity Pilot Project (HEPP) The Impact of Taxes on "junk Food" in Hungary - Case Study</i> . 2017. https://ec.europa.eu/health/sites/health/files/social_determinants/docs/hepp_case-studies_02_en.pdf .
31.	Ng SW, Rivera JA, Popkin BM, Colchero MA. Did high sugar-sweetened beverage purchasers respond differently to the excise tax on sugar-sweetened beverages in Mexico? <i>Public Health Nutr</i> . 2019;22(4):750-756. doi:10.1017/S136898001800321X
32.	Taillie LS, Rivera JA, Popkin BM, Batis C. Do high vs. low purchasers respond differently to a nonessential energy-dense food tax? Two-year evaluation of Mexico's 8% nonessential food tax. <i>Prev Med (Baltim)</i> . 2017;105:S37-S42. doi:10.1016/j.ypmed.2017.07.009
33.	Colchero MA, Popkin BM, Rivera JA, Ng SW. Beverage purchases from stores in Mexico under the excise tax on sugar sweetened beverages: observational study. <i>BMJ</i> . 2016;352:h6704. doi:10.1136/bmj.h6704
34.	Ells LJ, Roberts K, McGowan VJ, Machaira T. <i>Sugar Reduction: The Evidence for Action. Annexe 2: A Mixed Method Review of Behaviour Changes Resulting from Experimental Studies That Examine the Effect of Fiscal Measures Targeted at High Sugar Food and Non-Alcoholic Drink</i> . 2015. www.gov.uk/phe.
35.	<i>Fiscal Policies for Diet and the Prevention of Noncommunicable Diseases</i> . 2016. https://www.who.int/dietphysicalactivity/publications/fiscal-policies-diet-prevention/en/ .



36.	Colchero MA, Rivera-Dommarco J, Popkin BM, Ng SW. In Mexico, Evidence Of Sustained Consumer Response Two Years After Implementing A Sugar-Sweetened Beverage Tax. <i>Health Aff.</i> 2017;36(3):564-571. doi:10.1377/hlthaff.2016.1231
37.	McMillan SJ. Food and nutrition policy issues in remote Aboriginal communities: lessons from Arnhem Land. <i>Aust J Public Health.</i> 2010;15(4):281-285. doi:10.1111/j.1753-6405.1991.tb00348.x
38.	Lee A, Lewis M. Testing the Price of Healthy and Current Diets in Remote Aboriginal Communities to Improve Food Security: Development of the Aboriginal and Torres Strait Islander Healthy Diets ASAP (Australian Standardised Affordability and Pricing) Methods. <i>Int J Environ Res Public Health.</i> 2018;15(12):2912. doi:10.3390/ijerph15122912
39.	Wright A, Smith KE, Hellowell M. Policy lessons from health taxes: a systematic review of empirical studies. <i>BMC Public Health.</i> 2017;17(1):583. doi:10.1186/s12889-017-4497-z
40.	Rathbone Greenbank Investments. The UK sugar tax: one year on. 2019. https://www.rathbonegreenbank.com/insight/uk-sugar-tax-one-year .

Acceptability for stakeholders

3.	World Cancer Research Fund International. NOURISHING database.
7.	Cecchini M. <i>The Heavy Burden of Obesity.</i> ; 2019.
41.	Bosire EN, Stacey N, Mukoma G, Tugendhaft A, Hofman K, Norris SA. Attitudes and perceptions among urban South Africans towards sugar-sweetened beverages and taxation. <i>Public Health Nutr.</i> 2019;1-10. doi:10.1017/S1368980019001356
42.	Signal LN, Watts C, Murphy C, Eyles H, Ni Mhurchu C. Appetite for health-related food taxes: New Zealand stakeholder views. <i>Health Promot Int.</i> 2018;33(5):791-800. doi:10.1093/heapro/dax019
43.	Sundborn G, Thornley S, Baeglehole R, Bezzant N. Policy brief: a sugary drink tax for New Zealand and 10,000-strong petition snubbed by Minister of Health and National Government. <i>N Z Med J.</i> 2017;130(1462). https://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2017/vol-130-no-1462-22-september-2017/7370 .
44.	Street JM, Sisnowski J, Tooher R, Farrell LC, Braunack-Mayer AJ. Community perspectives on the use of regulation and law for obesity prevention in children: A citizens' jury. <i>Health Policy (New York).</i> 2017;121(5):566-573. doi:10.1016/j.healthpol.2017.03.001
45.	Moretto N, Kendall E, Whitty J, et al. Yes, The Government Should Tax Soft Drinks: Findings from a Citizens' Jury in Australia. <i>Int J Environ Res Public Health.</i> 2014;11(3):2456-2471. doi:10.3390/ijerph110302456
46.	Lloyd-Williams F, Bromley H, Orton L, et al. Smorgasbord or symphony? Assessing public health nutrition policies across 30 European countries using a novel framework. <i>BMC Public Health.</i> 2014;14(1):1195. doi:10.1186/1471-2458-14-1195
47.	Jou J, Niederdeppe J, Barry CL, Gollust SE. Strategic Messaging to Promote Taxation of Sugar-Sweetened Beverages: Lessons From Recent Political Campaigns. <i>Am J Public Health.</i> 2014;104(5):847-853. doi:10.2105/AJPH.2013.301679
48.	Tamir O, Cohen-Yogev T, Furman-Assaf S, Endevelt R. Taxation of sugar sweetened beverages and unhealthy foods: a qualitative study of key opinion leaders' views. <i>Isr J Health Policy Res.</i> 2018;7(1):43. doi:10.1186/s13584-018-0240-1
49.	Thomas-Meyer M, Mytton O, Adams J. Public responses to proposals for a tax on



	sugar-sweetened beverages: A thematic analysis of online reader comments posted on major UK news websites. <i>PLoS One</i> . 2017;12(11). https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0186750 .
50.	Barry CL, Niederdeppe J, Gollust SE. Taxes on Sugar-Sweetened Beverages. <i>Am J Prev Med</i> . 2013;44(2):158-163. doi:10.1016/j.amepre.2012.09.065
51.	World Health Organization. <i>Report of the Commission on Ending Childhood Obesity</i> . Geneva; 2016. https://apps.who.int/iris/bitstream/handle/10665/204176/9789241510066_eng.pdf;jsessionid=F4D88BFF8B024D8CB866CD3932D1F308?sequence=1 .
52.	Bødker M, Pisinger C, Toft U, Jørgensen T. The rise and fall of the world's first fat tax. <i>Health Policy (New York)</i> . 2015;119(6):737-742. doi:10.1016/j.healthpol.2015.03.003
53.	HM Revenue & Customs. <i>Soft Drinks Industry Levy. Summary of Responses.</i> ; 2016. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/575828/Soft_Drinks_Industry_Levy_-_summary_of_responses.pdf .
54.	Myers A, Fig D, Tugendhaft A, Mandle J, Myers J, Hofman K. Sugar and health in South Africa: Potential challenges to leveraging policy change. <i>Glob Public Health</i> . 2017;12(1):98-115. doi:10.1080/17441692.2015.1071419
55.	Vallgård S, Holm L, Jensen JD. The Danish tax on saturated fat: why it did not survive. <i>Eur J Clin Nutr</i> . 2015;69(2):223-226. doi:10.1038/ejcn.2014.224
56.	Massive treat-y: 10 health organisations join call for sugar tax. Rethink sugary drink. 2017. http://www.rethinksugarydrink.org.au/media/health-organisations-join-call-for-sugar-tax.html .
57.	Jamieoliver.com. What is the Soft Drinks Industry Levy (sugar tax)? Campaigns, Nutrition. 2018. https://www.jamieoliver.com/features/soft-drinks-industry-levy/ .
58.	The Food Foundation. <i>The UK's Sugar Levy.</i> ; 2017. https://foodfoundation.org.uk/wp-content/uploads/2017/07/2-Briefing-Sugar-Levy_vF.pdf .
59.	Taber DR, Dulin-Keita A, Fallon M, et al. Society of Behavioral Medicine (SBM) position statement: Enact taxes on sugar sweetened beverages to prevent chronic disease. <i>Transl Behav Med</i> . 2019;9(1):179-183. doi:10.1093/tbm/iby035
60.	Taxation and Sugar-Sweetened Beverages: Position of Dietitians of Canada. <i>Can J Diet Pract Res</i> . 2016;77(2):110-110. doi:10.3148/cjdp-2016-008
61.	British Medical Association. <i>Food for Thought: Promoting Healthy Diets among Children and Young People</i> . 2015.
62.	Barber S, Baker C, Foster D. <i>The Soft Drinks Industry Levy</i> . 2017.
63.	Buckton CH, Patterson C, Hyseni L, et al. The palatability of sugar-sweetened beverage taxation: A content analysis of newspaper coverage of the UK sugar debate. de Souza RJ, ed. <i>PLoS One</i> . 2018;13(12):e0207576. doi:10.1371/journal.pone.0207576

Front-of-pack nutrition labelling interventions

Costs and resources

7.	Cecchini M. <i>The Heavy Burden of Obesity.</i> ; 2019.
10.	Carter R, Moodie M, Markwick A, et al. Assessing Cost-Effectiveness in Obesity (ACE-Obesity): an overview of the ACE approach, economic methods and cost results. <i>BMC Public Health</i> . 2009;9(1):419. doi:10.1186/1471-2458-9-419
11.	Sacks G, Veerman JL, Moodie M, Swinburn B. 'Traffic-light' nutrition labelling and 'junk-food' tax: a modelled comparison of cost-effectiveness for obesity prevention. <i>Int J Obes</i> . 2011;35(7):1001-1009. doi:10.1038/ijo.2010.228
12.	World Health Organization. WHO-CHOICE. https://www.who.int/choice/cost-



	effectiveness/en/. 2014.
Equity and human rights	
64.	Milward-Brown. <i>How Has Awareness, Comprehension and Usage of GDA Labelling Evolved?</i> 2008. http://www.fdf.org.uk/publicgeneral/MilwardBrown_research_Sep08.pdf .
65.	Food Standards Agency. <i>Front of Pack (FOP) Nutrition Labelling</i> . 2007. https://www.food.gov.uk/sites/default/files/multimedia/pdfs/board/fsa100307.pdf .
66.	Stockley R, Jordan E, Hunter A. <i>Citizens' Forums on Food: Front of Pack (FoP) Nutrition Labelling Prepared for: Food Standards Agency</i> . 2010. https://webarchive.nationalarchives.gov.uk/20100929125556/http://www.food.gov.uk/multimedia/pdfs/citforumfop.pdf .
67.	Department for Business I& S. 2011 skills for life survey. UK Government. 2012. https://www.gov.uk/government/publications/2011-skills-for-life-survey .
68.	Sacks G, Rayner M, Swinburn B. Impact of front-of-pack "traffic-light" nutrition labelling on consumer food purchases in the UK. <i>Health Promot Int</i> . 2009;24(4):344-352. doi:10.1093/heapro/dap032
69.	Crosetto P, Lacroix A, Muller L, Ruffieux B. Modification des achats alimentaires en réponse à cinq logos nutritionnels. <i>Cah Nutr Diététique</i> . 2017;52(3):129-133. doi:10.1016/J.CND.2017.04.002
70.	Ducrot P, Méjean C, Julia C, et al. Objective Understanding of Front-of-Package Nutrition Labels among Nutritionally At-Risk Individuals. <i>Nutrients</i> . 2015;7(8):7106-7125. doi:10.3390/nu7085325
71.	Méjean C, Macouillard P, Péneau S, Hercberg S, Castetbon K. Perception of front-of-pack labels according to social characteristics, nutritional knowledge and food purchasing habits. <i>Public Health Nutr</i> . 2013;16(3):392-402. doi:10.1017/S1368980012003515
72.	Michail N. 5-C NutriScore to be France's official nutrition label. Food Navigator. 2017. https://www.foodnavigator.com/Article/2017/03/16/5-C-NutriScore-to-be-France-s-official-nutrition-label .
73.	Malloy-Weir L, Cooper M. Health literacy, literacy, numeracy and nutrition label understanding and use: a scoping review of the literature. <i>J Hum Nutr Diet</i> . 2017;30(3):309-325. doi:10.1111/jhn.12428
74.	Vyth EL, Steenhuis IH, Roodenburg AJ, Brug J, Seidell JC. Front-of-pack nutrition label stimulates healthier product development: a quantitative analysis. <i>Int J Behav Nutr Phys Act</i> . 2010;7(1):65. doi:10.1186/1479-5868-7-65
75.	Kanter R, Reyes M, Vandevijvere S, Swinburn B, Corvalán C. Anticipatory effects of the implementation of the Chilean Law of Food Labeling and Advertising on food and beverage product reformulation. <i>Obes Rev</i> . 2019. doi:10.1111/obr.12870
Acceptability for stakeholders	
66.	Stockley R, Jordan E, Hunter A. <i>Citizens' Forums on Food: Front of Pack (FoP) Nutrition Labelling Prepared for: Food Standards Agency</i> . 2010. https://webarchive.nationalarchives.gov.uk/20100929125556/http://www.food.gov.uk/multimedia/pdfs/citforumfop.pdf .
76.	Petition on European food labels seeks 1m signatures. The Connexion. 2019. https://www.connexionfrance.com/French-news/Pro-Nutri-Score-petition-on-European-food-labels-seeks-1m-signatures .
77.	Bhawra J, Reid JL, White CM, Vanderlee L, Raine K, Hammond D. Are young Canadians supportive of proposed nutrition policies and regulations? An overview of policy support and the impact of socio-demographic factors on public opinion. <i>Can J Public Heal</i> . 2018;109(4):498-505. doi:10.17269/s41997-018-0066-1
78.	Comans T, Moretto N, Byrnes J. Public Preferences for the Use of Taxation and



	Labelling Policy Measures to Combat Obesity in Young Children in Australia. <i>Int J Environ Res Public Health</i> . 2017;14(3):324. doi:10.3390/ijerph14030324
79.	<i>Global Nutrition Policy Review 2016-2017</i> . Geneva; 2018. https://apps.who.int/iris/bitstream/handle/10665/275990/9789241514873-eng.pdf?ua=1 .
80.	Italy to fight food traffic light system (3). ANSA. 2017. http://www.ansa.it/english/news/lifestyle/food_wine/2017/03/08/italy-to-fight-food-traffic-light-system-3_d1cee032-20b8-4340-bfde-bd208b4e5658.html .
81.	Michail N. Italy raises red flag once more over UK's traffic light label. Food Navigator. 2016. https://www.foodnavigator.com/Article/2016/03/16/Italy-raises-red-flag-once-more-over-UK-s-traffic-light-label .
82.	Codex Committee on Food Labelling. In: <i>Agenda Item 6: Proposed Draft Guidelines on Front-of-Pack Nutrition Labelling</i> . Ottawa, Ontario, Canada: European Union; 2019. https://ec.europa.eu/food/sites/food/files/safety/docs/codex_ccfl_45_agenda-item-06.pdf .
83.	Front of Pack Labelling. Policy Position. Food & drink federation. http://www.fdf.org.uk/keyissues.aspx?issue=636 .
84.	Schulz F. No colour-coded Nutri-Score for Nestlé in Germany. Euractiv.de. 2019. https://www.euractiv.com/section/agriculture-food/news/no-colour-coded-nutriscore-for-nestle-in-germany/ .
85.	Rixon P. New Italian body set up to fight traffic light labelling. IEG Policy. 2017. https://iegpolicy.agribusinessintelligence.informa.com/PL213331/New-Italian-body-set-up-to-fight-traffic-light-labelling .
86.	Nutella threatened by EU label laws, Italian claim. The Telegraph. 2010. https://www.telegraph.co.uk/foodanddrink/foodanddrinknews/7836423/Nutella-threatened-by-EU-label-laws-Italians-claim.html .
87.	Food and Agriculture Organization of the United Nations, World Health Organization. Codex Alimentarius Commission. In: <i>Joint FAO/WHO Food Standards Programme Codex Committee on Food Labelling. Forty-Fourth Session</i> . Asunción, Paraguay; 2017. http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-714-44%252FCRDs%252Ffl44_crd18.pdf .
88.	Campbell D. All supermarkets to adopt "traffic-light labelling" for nutrition. The Guardian. 2012. https://www.theguardian.com/business/2012/oct/24/supermarkets-traffic-light-labelling-nutrition .
89.	McDonald A. Market leaders Migros and Coop are against the traffic light view. Kxan36. 2019. https://www.kxan36news.com/market-leaders-migros-and-coop-are-against-the-food-traffic-light-view .
90.	European Commission Consultation. <i>Labelling: Competitiveness, Consumer Information and Better Regulation for the EU</i> . https://ec.europa.eu/food/sites/food/files/safety/docs/labelling-nutrition_better-reg_indiv-resp_153.pdf .
91.	Codex committee started negotiations on front-of-pack nutrition labelling. Consumers International. 2019. https://www.consumersinternational.org/news-resources/news/releases/codex-committee-started-negotiations-on-front-of-pack-nutrition-labelling/ .
92.	<i>Joint Response to UK Consultation on Front of Pack Nutrition Labelling</i> . https://www.cancerresearchuk.org/sites/default/files/joint_response_to_uk_fop_consultation_final.pdf .
93.	BMRB Social Research, Food, Consumer B and HRC at the U of S. <i>Comprehension and Use of UK Nutrition Signpost Labelling Schemes</i> . 2008.



	https://webarchive.nationalarchives.gov.uk/20120403230459/http://www.food.gov.uk/multimedia/pdfs/quantrationale.pdf .
94.	Lobstein T, Landon J, Lincoln P. <i>The Problems with Guideline Daily Amounts (GDAs). A Review of GDAs and Their Use for Signalling Nutritional Information on Food and Drink Labels</i> . London; 2007. https://studyres.com/doc/17781795/misconceptions-and-misinformation--the-problems-with-gdas .
95.	Thow AM, Jones A, Schneider CH, Labonté R. Global Governance of Front-of-Pack Nutrition Labelling: A Qualitative Analysis. <i>Nutrients</i> . 2019;11(2). doi:10.3390/nu11020268
96.	<i>European Food and Nutrition Action Plan 2015-2020</i> . Copenhagen; 2014. http://www.euro.who.int/en/who-we-are/governance .
97.	Nutrient Profiling. WHO. https://www.who.int/nutrition/topics/profiling/en/ .
98.	Kanter R, Vanderlee L, Vandevijvere S. Front-of-package nutrition labelling policy: global progress and future directions. <i>Public Health Nutr</i> . 2018;21(8):1399-1408. doi:10.1017/S1368980018000010
99.	Hercberg S, Chantal J. Front-of-pack labels: why are certain agro-industrial firms resisting? <i>The Conversation</i> . 2017. https://theconversation.com/front-of-pack-nutrition-labels-why-are-certain-agro-industrial-firms-resisting-87975 .
100.	Nestlé. Nestlé announces support for Nutri-Score in Continental Europe. 2019. https://www.nestle.com/asset-library/documents/media/nestle-supports-nutri-score-in-continental-europe-june-2019.pdf .

Children's exposure to marketing interventions

Costs and resources

10.	Carter R, Moodie M, Markwick A, et al. Assessing Cost-Effectiveness in Obesity (ACE-Obesity): an overview of the ACE approach, economic methods and cost results. <i>BMC Public Health</i> . 2009;9(1):419. doi:10.1186/1471-2458-9-419
14.	Gortmaker SL, Wang YC, Long MW, et al. Three Interventions That Reduce Childhood Obesity Are Projected To Save More Than They Cost To Implement. <i>Health Aff</i> . 2015;34(11):1932-1939. doi:10.1377/hlthaff.2015.0631
101.	Brown V, Ananthapavan J, Veerman L, et al. The Potential Cost-Effectiveness and Equity Impacts of Restricting Television Advertising of Unhealthy Food and Beverages to Australian Children. <i>Nutrients</i> . 2018;10(5):622. doi:10.3390/nu10050622
102.	<i>Tackling Food Marketing to Children in a Digital World: Trans-Disciplinary Perspectives. Children's Rights, Evidence of Impact, Methodological Challenges, Regulatory Options and Policy Implications for the WHO European Region</i> . Copenhagen; 2016. http://www.euro.who.int/pubrequest .
103.	<i>Monitoring and Restricting Digital Marketing of Unhealthy Products to Children and Adolescents</i> . Moscow; 2018. http://www.euro.who.int/__data/assets/pdf_file/0008/396764/Online-version_Digital-Mktg_March2019.pdf .
104.	Garde A, Byrne S, Gokani N, Murphy B. <i>A Child Rights-Based Approach to Food Marketing: A Guide for Policy Makers</i> . 2018. www.unicef.org/csr .

Equity and human rights

104.	Garde A, Byrne S, Gokani N, Murphy B. <i>A Child Rights-Based Approach to Food Marketing: A Guide for Policy Makers</i> . 2018. www.unicef.org/csr .
105.	<i>Set of Recommendations on the Marketing of Foods and Non-Alcoholic Beverages to Children</i> . Geneva; 2010. https://apps.who.int/iris/bitstream/handle/10665/44416/9789241500210_eng.pdf?se



	quence=1.
106.	<i>International Code of Marketing of Breast-Milk Substitutes</i> . Geneva; 1981. https://apps.who.int/iris/bitstream/handle/10665/40382/9241541601.pdf?sequence=1 .
107.	<i>Guidance on Ending the Inappropriate Promotion of Foods for Infants and Young Children. Implementation Manual</i> . Geneva; 2017. https://apps.who.int/iris/bitstream/handle/10665/260137/9789241513470-eng.pdf .
108.	World Health Organization Regional Office for Europe. <i>Commercial Foods for Infants and Young Children in the WHO European Region</i> . Copenhagen; 2019. http://www.euro.who.int/pubrequest .
109.	Lupiáñez-Villanueva F, Gaskell G, Veltri G, et al. <i>Study on the Impact of Marketing through Social Media, Online Games and Mobile Applications on Children's Behaviour. Final Report</i> . Brussels; 2016. https://ec.europa.eu/info/sites/info/files/online_marketing_children_final_report_en.pdf .
110.	Ells LJ, Roberts K, McGowan VJ, Machaira T. <i>Sugar Reduction: The Evidence for Action. Annexe 3: A Mixed Method Review of Behaviour Changes Resulting from Marketing Strategies Targeted at High Sugar Food and Non-Alcoholic Drink.</i> ; 2015. www.gov.uk/phe .
111.	Adams J, Tyrrell R, Adamson AJ, White M. Socio-economic differences in exposure to television food advertisements in the UK: a cross-sectional study of advertisements broadcast in one television region. <i>Public Health Nutr</i> . 2012;15(3):487-494. doi:10.1017/S1368980011001686
112.	Harris JL, Schwartz MB, Brownell KD, et al. <i>Evaluating Fast Food Nutrition and Marketing to Youth Fast Food FACTS: Evaluating Fast Food Nutrition and Marketing to Youth</i> . 2010. http://fastfoodmarketing.org/media/FastFoodFACTS_Report_2010.pdf .
113.	Zimmerman FJ, Shimoga S V. The effects of food advertising and cognitive load on food choices. <i>BMC Public Health</i> . 2014;14(1):342. doi:10.1186/1471-2458-14-342
114.	Klepp K-I, Wind M, de Bourdeaudhuij I, et al. Television viewing and exposure to food-related commercials among European school children, associations with fruit and vegetable intake: a cross sectional study. <i>Int J Behav Nutr Phys Act</i> . 2007;4:46. doi:10.1186/1479-5868-4-46
115.	Vereecken CA, Todd J, Roberts C, Mulvihill C, Maes L. Television viewing behaviour and associations with food habits in different countries. <i>Public Health Nutr</i> . 2006;9(2):244-250. http://www.ncbi.nlm.nih.gov/pubmed/16571179 .
116.	Donohue TR, Meyer TP, Henke LL. Black and White Children: Perceptions of TV Commercials. <i>J Mark</i> . 1978;42(4):34. doi:10.2307/1250083
117.	Mills SDH, Tanner LM, Adams J. Systematic literature review of the effects of food and drink advertising on food and drink-related behaviour, attitudes and beliefs in adult populations. <i>Obes Rev</i> . 2013;14(4):303-314. doi:10.1111/obr.12012

Acceptability for stakeholders

Footnote 1	YouGov Plc. 2019. Fieldwork undertaken between 12th-13th February 2019..
51.	World Health Organization. <i>Report of the Commission on Ending Childhood Obesity</i> . Geneva; 2016. https://apps.who.int/iris/bitstream/handle/10665/204176/9789241510066_eng.pdf;jsessionid=F4D88BFF8B024D8CB866CD3932D1F308?sequence=1 .
79.	<i>Global Nutrition Policy Review 2016-2017</i> . Geneva; 2018. https://apps.who.int/iris/bitstream/handle/10665/275990/9789241514873-eng.pdf?ua=1 .



105.	<i>Set of Recommendations on the Marketing of Foods and Non-Alcoholic Beverages to Children</i> . Geneva; 2010. https://apps.who.int/iris/bitstream/handle/10665/44416/9789241500210_eng.pdf?sequence=1 .
109.	Lupiáñez-Villanueva F, Gaskell G, Veltri G, et al. <i>Study on the Impact of Marketing through Social Media, Online Games and Mobile Applications on Children's Behaviour. Final Report</i> . Brussels; 2016. https://ec.europa.eu/info/sites/info/files/online_marketing_children_final_report_en.pdf .
110.	Ells LJ, Roberts K, MCGowan VJ, Machaira T. <i>Sugar Reduction: The Evidence for Action. Annexe 3: A Mixed Method Review of Behaviour Changes Resulting from Marketing Strategies Targeted at High Sugar Food and Non-Alcoholic Drink.</i> ; 2015. www.gov.uk/phe .
111.	Adams J, Tyrrell R, Adamson AJ, White M. Socio-economic differences in exposure to television food advertisements in the UK: a cross-sectional study of advertisements broadcast in one television region. <i>Public Health Nutr</i> . 2012;15(3):487-494. doi:10.1017/S1368980011001686
112.	Harris JL, Schwartz MB, Brownell KD, et al. <i>Evaluating Fast Food Nutrition and Marketing to Youth Fast Food FACTS: Evaluating Fast Food Nutrition and Marketing to Youth</i> . 2010. http://fastfoodmarketing.org/media/FastFoodFACTS_Report_2010.pdf .
113.	Zimmerman FJ, Shimoga S V. The effects of food advertising and cognitive load on food choices. <i>BMC Public Health</i> . 2014;14(1):342. doi:10.1186/1471-2458-14-342
114.	Klepp K-I, Wind M, de Bourdeaudhuij I, et al. Television viewing and exposure to food-related commercials among European school children, associations with fruit and vegetable intake: a cross sectional study. <i>Int J Behav Nutr Phys Act</i> . 2007;4:46. doi:10.1186/1479-5868-4-46
115.	Vereecken CA, Todd J, Roberts C, Mulvihill C, Maes L. Television viewing behaviour and associations with food habits in different countries. <i>Public Health Nutr</i> . 2006;9(2):244-250. http://www.ncbi.nlm.nih.gov/pubmed/16571179 .
116.	Donohue TR, Meyer TP, Henke LL. Black and White Children: Perceptions of TV Commercials. <i>J Mark</i> . 1978;42(4):34. doi:10.2307/1250083
117.	Mills SDH, Tanner LM, Adams J. Systematic literature review of the effects of food and drink advertising on food and drink-related behaviour, attitudes and beliefs in adult populations. <i>Obes Rev</i> . 2013;14(4):303-314. doi:10.1111/obr.12012
118.	Boyland EJ, Nolan S, Kelly B, et al. Advertising as a cue to consume: a systematic review and meta-analysis of the effects of acute exposure to unhealthy food and nonalcoholic beverage advertising on intake in children and adults. <i>Am J Clin Nutr</i> . 2016;103(2):519-533. doi:10.3945/ajcn.115.120022
119.	Kim KH, Kang E, Yun YH. Public support for health taxes and media regulation of harmful products in South Korea. <i>BMC Public Health</i> . 2019;19(1):665. doi:10.1186/s12889-019-7044-2
120.	Tripicchio G, Heo M, Diewald L, et al. Restricting Advertisements for High-Fat, High-Sugar Foods during Children's Television Programs: Attitudes in a US Population-Based Sample. <i>Child Obes</i> . 2016;12(2):113-118. doi:10.1089/chi.2015.0174
121.	Suggs LS, McIntyre C. European Union public opinion on policy measures to address childhood overweight and obesity. <i>J Public Health Policy</i> . 2011;32(1):91-106. doi:10.1057/jphp.2010.44
122.	Dorfman L, Wallack L, Woodruff K. More than a message: framing public health advocacy to change corporate practices. <i>Heal Educ Behav</i> . 2005;32(3):320-336. doi:10.1177/1090198105275046



123.	Théodore F, Juárez-Ramírez C, Cahuana-Hurtado L, Blanco I, Tolentino-Mayo L, Bonvecchio A. [Barriers and opportunities for the regulation of food and beverage advertising to children in Mexico]. <i>Salud Publica Mex.</i> 2014;56 Suppl 2:s123-9. http://www.ncbi.nlm.nih.gov/pubmed/25629244 .
124.	Public Health England. <i>Sugar Reduction The Evidence for Action</i> . London; 2015.
125.	Responsible marketing. International Food & Beverage Alliance. https://ifballiance.org/commitments/responsible-marketing-to-children .
126.	EU Pledge. https://eu-pledge.eu/ .
127.	Children's Food and Beverage Advertising Initiative (CFBAI). BBB National Programs, Inc. https://bbbprograms.org/programs/CFBAI/ .
128.	Our response on publication of the government consultation on food advertising restrictions. Advertising Association. 2019. https://www.adassoc.org.uk/policy-areas/advertising-association-response-on-publication-of-the-government-consultation-on-food-advertising-restrictions/ .
129.	<i>The Challenge of Childhood Obesity: The Advertising Industry's Perspective</i> . 2019. https://www.adassoc.org.uk/wp-content/uploads/2019/03/Advertising-Association-report-The-challenge-of-childhood-obesity-1.pdf .
130.	Obesity Health Alliance. Protect children from all junk food advertising, say health experts - and parents agree. 2019. http://obesityhealthalliance.org.uk/2019/02/28/protect-children-junk-food-advertising-say-health-experts-parents-agree/ .
131.	Consumers International, World Obesity Federation. <i>Recommendations towards a Global Convention to Protect and Promote Healthy Diets</i> . 2014. https://www.consumersinternational.org/media/2211/recommendations-for-a-convention-on-healthy-diets-low-res-for-web.pdf .
132.	IASO, Consumers International, International Obesity Taskforce. <i>Recommendations for an International Code on Marketing of Foods and Non-Alcoholic Beverages to Children</i> . 2008. www.iotf.org/sydneyprinciples .
133.	Swinburn B, Sacks G, Lobstein T, et al. Sydney Principles' for reducing the commercial promotion of foods and beverages to children. <i>Public Health Nutr.</i> 2008;11(9):881-886. doi:10.1017/S136898000800284X