

# Rapid Synthesis

Identifying Effective and Cost-effective  
Population-level Approaches to Promote  
Healthy Eating

29 March 2018



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**Rapid Synthesis:**  
**Identifying Effective and Cost-effective Population-level Approaches to Promote Healthy Eating**  
**30-day response**

29 March 2018

#### McMaster Health Forum and Forum+

The goal of the McMaster Health Forum, and its Forum+ initiative, is to generate action on the pressing health- and social-system issues of our time, based on the best available research evidence and systematically elicited citizen values and stakeholder insights. We aim to strengthen health and social systems – locally, nationally, and internationally – and get the right programs, services and products to the people who need them. In doing so, we are building on McMaster’s expertise in advancing human and societal health and well-being.

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#### Timeline

Rapid syntheses can be requested in a three-, 10- or 30-business-day timeframe. This synthesis was prepared over a 30-business-day timeframe. An overview of what can be provided and what cannot be provided in each of the different timelines is provided on McMaster Health Forum’s Rapid Response program webpage ([www.mcmasterforum.org/find-evidence/rapid-response](http://www.mcmasterforum.org/find-evidence/rapid-response)).

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#### Conflict of interest

The authors declare that they have no professional or commercial interests relevant to the rapid synthesis. The funder played no role in the identification, selection, assessment, synthesis or presentation of the research evidence profiled in the rapid synthesis.

#### Merit review

The rapid synthesis was reviewed by a small number of policymakers, stakeholders and researchers in order to ensure its scientific rigour and system relevance.

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## KEY MESSAGES

### Question

- What are the costs or cost-effectiveness of population-level policies designed to promote healthy eating?

### Why the issue is important

- There is a well-documented global trend toward increased consumption of energy-dense and high-fat foods, combined with increases in sedentary lifestyles.
- These changes have led to a global epidemic of overweight and obesity, as well as significantly increased risks for many diseases, including cardiovascular disease, diabetes, musculoskeletal disorders, and a number of different types of cancer.
- With respect to cancer (which is the focus of the Canadian Partnership Against Cancer, who requested this rapid synthesis), unhealthy diets, physical inactivity, excess body weight and associated factors are the next most important preventable causes of cancer after smoking, and they account for more than half of all cancers worldwide.
- Given this, adopting the recommendations of the 2007 World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) Cancer Report could prevent a significant number of cancer cases, as well as reduce rates of overweight and obesity, as well as highly prevalent chronic diseases such as cardiovascular disease and diabetes.
- However, promoting healthy eating at a population level is complex and requires a mix of population-level approaches that support healthy choices and alter the availability and affordability of healthy foods.

### What we found

- We searched for evidence on the effectiveness and cost-effectiveness of seven policy instruments that were prioritized by the requestor, including: 1) regulating the marketing of food; 2) modifying the labelling of foods; 3) adjusting the price of foods; 4) creating a healthy retail and food service environment; 5) promoting community access and availability of healthy foods; 6) improving the nutritional quality of the food supply; and 7) implementing or modifying standards for food available in public institutions.
- We identified 45 relevant documents with evidence related to the costs or cost-effectiveness of population-level policies to promote healthy eating, including 23 systematic reviews, one non-systematic review, one book, three reports and 17 primary studies.
- Generally, evidence supports the use of population-level policy instruments as a cost-effective means of promoting healthy eating and curbing consumption of less healthy food, with a considerable amount of evidence found addressing the effectiveness and cost-effectiveness of instruments modifying the labelling of foods and adjusting the price of food, and relatively less literature on the remaining four interventions.
- We found that the implementation of mass media campaigns, mandatory labelling and traffic-light labelling (e.g., using traffic-light colour coding to show how much fat, saturated fats, sugar and salt are in food) were generally cost-effective or cost-saving interventions to improve the consumption of healthy foods across a variety of country contexts.
- Similarly, systematic reviews and primary studies reported that adjusting the price of food was a cost-effective intervention to incentivize healthy eating. However, the literature notes that the effectiveness of tax interventions are dependent on a variety of factors, including: whether a group of foods or a specific nutrient is taxed; whether a tax is levied during the production of a food or beverage or at purchase; the type of tax that is levied; the percentage of tax; and the tax system in which it is being implemented.
- We did not find any evidence on the cost-effectiveness of creating healthy retail and food-service environments or on promoting access and availability of healthy foods, though we found considerable evidence supporting the reduction of salt content in processed foods by establishing thresholds as a cost-effective intervention.
- Finally, we found evidence supporting the provision of free fruit at school, regulation of nutritional content of school meals, and replacing snacks in vending machines with healthy options.

## **QUESTION**

- What are the costs or cost-effectiveness of population-level policies designed to promote healthy eating?

## **WHY THE ISSUE IS IMPORTANT**

There is a well-documented global trend toward increased consumption of energy-dense and high-fat foods, combined with increases in sedentary lifestyles.(1) These changes have contributed to a global epidemic of overweight and obesity, as well as significantly increased risks for many diseases, including cardiovascular disease, diabetes, musculoskeletal disorders, and a number of different types of cancer.(1)

In addition, those who are overweight or obese are at increased risk for a wide array of health conditions, including:

- all-causes of death (mortality);
- cardiovascular disease and stroke (and several associated risk factors such as high blood pressure, high LDL cholesterol, low HDL cholesterol, or high levels of triglycerides);
- some cancers (e.g., obesity increases the risk of cancer of the colorectum, breast (in postmenopausal women), endometrium, esophagus, pancreas, liver and kidney);
- Type 2 diabetes;
- gallbladder disease;
- osteoarthritis;
- sleep apnea and breathing problems;
- low quality of life;
- mental illness such as clinical depression, anxiety, and other mental disorders; and
- body pain and difficulty with physical functioning.(2-5)

With respect to cancer (which is the focus of the Canadian Partnership Against Cancer, who requested this rapid synthesis), “after smoking, unhealthy diets, physical inactivity, excess body weight, and associated factors are the next most important preventable causes of cancer.”(6) Moreover, for those who do not smoke, these factors are the most important preventable causes of cancer, and estimates indicate that they are related to more than half of all cancers worldwide. In addition, adopting the recommendations of the 2007 World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) Cancer Report could prevent a significant number of cancer cases, as well as reduce rates of overweight and obesity, as well as the risk of highly prevalent chronic diseases such as cardiovascular disease and diabetes.(6; 7)

However, promoting healthy eating at a population level is complex and requires a mix of population-level approaches that support healthy choices and alter the availability and affordability of healthy foods. Given this, the Canadian Partnership Against Cancer requested this rapid synthesis to identify relevant research evidence about the costs and cost-effective of a range of population-level policy instruments that could be

### **Box 1: Background to the rapid synthesis**

This rapid synthesis mobilizes both global and local research evidence about a question submitted to the McMaster Health Forum’s Rapid Response program. Whenever possible, the rapid synthesis summarizes research evidence drawn from systematic reviews of the research literature and occasionally from single research studies. A systematic review is a summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select and appraise research studies, and to synthesize data from the included studies. The rapid synthesis does not contain recommendations, which would have required the authors to make judgments based on their personal values and preferences.

Rapid syntheses can be requested in a three-, 10- or 30-business-day timeframe. An overview of what can be provided and what cannot be provided in each of these timelines is provided on the McMaster Health Forum’s Rapid Response program webpage ([www.mcmasterforum.org/find-evidence/rapid-response](http://www.mcmasterforum.org/find-evidence/rapid-response)).

This rapid synthesis was prepared over a 30-business-day timeframe and involved four steps:

- 1) submission of a question from a policymaker or stakeholder (in this case, the Canadian Partnership Against Cancer);
- 2) identifying, selecting, appraising and synthesizing relevant research evidence about the question;
- 3) drafting the rapid synthesis in such a way as to present concisely and in accessible language the research evidence; and
- 4) finalizing the rapid synthesis based on the input of at least two merit reviewers.

used to promote healthy eating. The population-level policy instruments prioritized by the Canadian Partnership Against Cancer include:

- regulating the marketing of foods;
- modifying labelling of foods;
- adjusting the price of foods;
- creating a healthy retail and food service environment;
- promoting community access and availability of healthy foods;
- improving the nutritional quality of the food supply; and
- implementing or modifying standards for food available in public institutions.

## WHAT WE FOUND

We identified 45 relevant documents with evidence of cost-effectiveness of population-level policies to promote healthy eating. To be included documents had to address one of seven population-level policy instruments described above. Based on this criterion, we included 23 systematic reviews,(8-30) one non-systematic review,(31) one book,(32) three reports (14; 33; 34) and 17 primary studies.(35-51) The methodological quality of reviews varied with six low-,(13-16; 19; 25) 14 medium- (8; 9; 11; 12; 17; 20; 22-24; 26-30) and three high-quality (10; 18; 21) systematic reviews. While our search strategy (detailed in Box 2) was focused on finding evidence about the costs and cost-effectiveness of these population-level instruments, we have also included relevant findings from the included documents about the effectiveness of and health outcomes related to these policies. The findings about effects and health outcomes should not be taken to be a comprehensive assessment of the evidence in this area, which would have required a more comprehensive search and synthesis of the literature. Further, many of the systematic reviews included a mix of observational and simulation studies, while the primary studies included tended to be simulations of population-level policies. There was also a considerable amount of heterogeneity in the indicators used across the 45 documents, which at times made it difficult to compare the results obtained. These instances have been noted in the text and summary tables below.

Generally, evidence supports the use of population-level policy instruments as a cost-effective means of promoting healthy eating and curbing consumption of less healthy food. A report from the Organisation for Economic Cooperation and Development compared individual-level to population-level policy instruments and found that while the health effects are largest for individual interventions, they are also the most costly to

### Box 2: Identification, selection and synthesis of research evidence

We identified research evidence (systematic reviews and primary studies) by searching (in March 2018) Social Systems Evidence ([www.socialsystemsevidence.org](http://www.socialsystemsevidence.org)), NHS Economic Evaluation Database, and EconLit. In Social Systems Evidence under food safety and security programs or services, we used filters for food access, nutritional awareness and education, and food standards. In the NHS Economic Evaluation Database we used the following search strategy: MeSH subheading [Obesity] OR MeSH subheading [body weight change] AND (regulat\* OR incentive\* OR price OR tax\* OR standard\* OR availability OR accessibility) [2002-present]. In EconLit, we used the following search strategy: (healthy eating OR nutrition OR food OR obes\* OR body weight change) AND (regulat\* OR incentive\* OR price OR tax\* OR standard\* OR availability OR accessibility) AND (economic evaluation OR cost OR health technology assessment) [2002 – present]. In addition, targeted searches were made in EconLit for select interventions using the following three search strategies: 1) (healthy eating OR nutrition OR food OR obes\* OR body weight change) AND (labelling OR warning OR advertising OR marketing); 2) (healthy eating OR nutrition OR food OR obes\* OR body weight change) AND (food supply OR suppliers OR industry); and 3) (healthy eating OR nutrition OR food OR obes\* OR body weight change) AND (standards).

The results from the searches were assessed by one reviewer for inclusion. A document was included if it fit within the scope of the questions posed for the rapid synthesis.

For each systematic review we included in the synthesis, we documented the focus of the review, key findings, last year the literature was searched (as an indicator of how recently it was conducted), methodological quality using the AMSTAR quality appraisal tool (see the Appendix for more detail), and the proportion of the included studies that were conducted in Canada. Primary studies were included from our search when they directly answered the question at hand. For these studies, we documented the focus of the study, methods used, a description of the sample, the jurisdiction(s) studied, key features of the intervention, and key findings. We then used this extracted information to develop a synthesis of the key findings from the included reviews and primary studies.

implement, and therefore have consistently lower cost-effectiveness ratios than population-level instruments.(34) Further, the reach and timespan of analysis can significantly influence the cost-effective ratio, with population-level interventions having a larger reach and often taking significantly longer for outcomes to appear. We found a considerable amount of literature examining the effectiveness and cost-effectiveness of instruments modifying the marketing and labelling of foods and adjusting the price of food, and relatively less literature on the remaining four interventions. We review our findings for each of the policy instruments below, with detailed findings summarized in Table 1.

### *Regulating the marketing of food*

The first population-level policy instrument is focused on regulating the marketing of food, both by reducing the extent to which individuals, particularly children, are exposed to advertising for unhealthy foods and beverages, as well increasing marketing approaches to encourage consumption of healthier food products.

Policy options may include:

- restricting marketing of less healthy foods to adults and children;
- increasing the marketing of healthy alternatives through media campaigns; and
- regulating health or nutrition claims.

We found six systematic reviews (three older medium quality, two older low quality and one recent medium quality),(12-14; 17; 22) one report (34) and three primary studies (36; 37; 50) that addressed regulations for the marketing of food.

One primary study examined changes in food consumption habits in young children based on advertising trends on television.(37) Overall, it was found that increases in television advertising for certain foods and beverages increased children's tendency to consume those items (e.g., a 100% increase in advertising for carbonated soft drinks correlated with a 6.5% increase in children's consumption of these beverages, and a 1.3% increase in consumption in response to fast-food advertising).(37)

Regulation of television ads, both voluntary and mandatory, were found to have mixed levels of cost-effectiveness, with one older low-quality review and one older medium-quality review reporting that it is a cost-effective intervention, while an OECD report found that in the short term it is not cost-effective and only falls below the cost-effectiveness threshold after 20 years of implementation for self (or voluntary) regulation, and 35 years for mandatory regulation.(14; 34) The discrepancy in findings may be due to the systematic review not including the cost of changing regulations, additional food costs for families to switch consumption habits, and/or the impact on revenue streams of advertising companies.(14)

With respect to effectiveness, the literature has generally found that, on their own, these policy options do not have a large effect on health or diet, though there is some evidence from Quebec and from a report published by the French Institute for Agricultural Research that over the long term, bans on advertising fast food and junk food to children may be effective.(13) This finding is supported by one recent medium-quality review which found strong relationships between marketing practices and changes in food preference, including for the targeted promotion of low-fat food options.(12)

One related primary study examined the effectiveness of single interventions that were often focused on treatment as compared to more holistic policy interventions that focused on prevention and 'upstream' factors in the food environment. The study indicates that policy interventions were the most cost-effective approach, and that the majority of policy interventions were found to be cost-saving and had incremental cost-effectiveness ratios of below \$6,000 Australian per disability-adjusted life year.(36)



*Modifying labelling of foods*

The second population-level policy instrument focuses on modifying labelling of food to support the easy identification of healthy foods. Policy options may include:

- menu labelling;
- front of pack labelling;
- calorie/nutrient/ingredient labelling; and
- warning labels.

We found eight systematic reviews (two recent high quality, four recent medium quality, one recent medium quality and one recent low quality),(15; 18; 20-24; 27) two reports,(33; 34) and two primary studies relevant to this policy instrument.(46; 52)

The literature found the implementation of mass-media campaigns, mandatory labelling and traffic-light labelling (e.g., using traffic-light colour coding to show how much fat, saturated fats, sugar and salt are in food) were generally cost-effective or cost-saving interventions (using a US\$50,000 per disability adjusted life year (DALY) threshold) to improve the consumption of healthy foods across a variety of country contexts.(17; 22; 34; 46; 52)

Further, two high-quality and one medium-quality reviews found that while labelling interventions alone do not result in changes to consumption habits of less healthy foods, the effectiveness of this intervention improves when combined with other interventions such as simple icons, checklists, logos from influential organizations, or economic incentives.(15; 21; 23; 24) A report developed by the French Institute for Agricultural Research also suggested that nutritional labelling is effective when accompanied by a simple explanation of how to interpret the information presented.(33) Further, one recent medium-quality systematic review found that labelling interventions can influence manufacturers' practice such as fostering reformulation of foods.(24) It should be noted only a smaller percentage of the literature examined compensatory behaviour, either within or across meals, which could significantly change the effectiveness of these policies.(13)

*Adjusting the price of food*

The focus of the second population-level policy instrument is on adjusting the cost of food and beverages, whether through taxes or subsidies, to incentivize consumers to make healthy choices. This may include:

- taxes;
- subsidies to promote healthy eating;
- food-related income support; and
- financial or other support for or from insurance companies, employers, or health professional who promote and prescribe healthy diets.

The majority of the literature we found related to adjusting the price of food, which includes 15 systematic reviews (four older low quality, four older medium quality, three recent medium quality, two older high quality and three recent high quality)(9; 10; 13; 17; 21; 22; 24-26; 28-30; 53; 54), one book (32), one report (33) and eight primary studies.(35; 38-40; 43; 45; 48; 51) Globally, there is more evidence on the use of taxes on sugar-sweetened beverages than other foods and beverages.

There was general consensus across systematic reviews and primary studies that adjusting the price of food was a cost-effective intervention to incentivize healthy eating. Specifically, one older high-quality review found taxation of unhealthy food and beverages and subsidization of healthy foods and beverages had a probability of being 100% cost-effective and cost-saving in Australia, the U.K. and Mexico.(22)

However, the literature also notes that the effectiveness of tax interventions are dependent on a variety of factors, including: whether a group of foods or a specific nutrient is taxed; whether a tax is levied during the production of a food or beverage or at purchase; the type of tax that is levied; the percentage of tax; and the tax system in which it is being implemented. For example, one recent medium-quality review found that while taxing a single nutrient such as salt or sugar reduced consumption, a substitution effect of other less healthy nutrients was observed.(28) Similarly, one primary study suggested that taxing sugar-sweetened beverages is more effective on a per-calorie rather than per-ounce basis, while another primary study suggested that a tax on producers (rather than on consumers) is direct and results in a comparably small loss in consumer surplus (i.e., the difference between what consumers are willing and able to pay and the amount they actually pay).(45; 51) There is some agreement in the literature regarding the rate of taxation, suggesting a minimum rate of 20%.(9; 24-26; 28; 30)

In 2016, the World Health Organization (WHO) released recommendations on the use of fiscal policies to reduce noncommunicable diseases that support these findings about taxation, and further suggested that greater effects on energy intake can be accomplished by combining subsidies on fruits and vegetables with the taxation of target foods and beverages.(55) A report published by the French National Institute of Agricultural Research confirmed this finding, but also suggested that combining price policies with information interventions such as mass-media campaigns or changes to labelling are most effective.(33)

One recent high-quality review on the use of taxes and subsidies found that in high-income countries, the use of taxes and subsidies was positively associated with healthy food consumption, but it also found a minimal effect on anthropometric measurements (e.g., body mass index and waist circumference).(10) In both upper middle-income and lower middle-income countries, a predicted effect was found between subsidies on food consumption and anthropometric measurements.(10) One older low-quality review suggested that providing subsidies for healthy food is more cost-effective than levying taxes to disincentivize the purchases of unhealthy food among low-income consumers.(13) However, other similar studies included in the review found an increase in consumption of unhealthy food following the implementation of subsidies as the budget saved could be allocated to unhealthy foods.(13) Another older low-quality review found that a 10% decrease in price (subsidy) increased consumption of fruits and vegetables by 12%, whereas a 10% increase in price (tax) decreased consumption of unhealthy foods by 6%.(29) Similarly, one older medium-quality review found that the provision of vouchers to increase fruit and vegetable consumption was cost-ineffective, with a cost-effectiveness ratio of \$2.5 million Australian per DALY averted.(17)

A frequent criticism that was discussed in the literature was whether pricing policies, specifically the implementation of taxes, put undue pressure on low-income consumers. Taxing unhealthy food was consistently found to be a regressive policy (i.e., places a greater economic burden on low-income consumers). However, as low-income groups have a greater sensitivity to changes in price, it was also identified as one of the only interventions that produced consistently larger health gains in lower-income groups.(34)

#### *Creating healthy retail and food-service environments*

The focus of the third population-level policy instrument is on increasing the healthy food options and ingredients used at food outlets, as well as making healthy choices easier for consumers to make. This could include:

- incentives and rules to reduce less healthy food and ingredients in food-service outlets; or
- incentives to increase the availability of healthy foods.

We did not find any evidence on the cost-effectiveness of these policy options. However, we found one recent high-quality review that found that working with food-service outlets to increase the availability of healthy foods resulted in small improvements in healthier options being made available (e.g., by providing carrot sticks or apple slices as side dishes), as well as an increase in the distribution of educational

material.(21) The same review also found that working with food outlets to change the content of pre-packaged children's meals reduced the overall quantity of calories purchased, increased purchases of non-fat chocolate milk and reduced purchases of carbonated drinks.(21)

*Promoting access and availability of healthy foods*

The focus of the fourth population-level policy instrument is on increasing the availability of healthy foods to communities by growing the density of grocery stores and farmers' markets, particularly in low-income areas where these amenities may not be close by. This could include:

- urban planning and land-use policies;
- zoning bylaws;
- density, vicinity and restrictions of food outlets to schools; or
- incentives for stores or supermarkets to locate in underserved areas.

In addition we found one older high-quality review and one recent medium-quality review that addressed the effectiveness of these policies on changing consumption of healthy foods.(8; 24) The older high-quality systematic review found that the presence of local farmers' markets that included provision of vouchers for community members increased the consumption of fruit and vegetables and acted as a learning opportunity for children in the community.(8) Though more closely related to findings in the pricing policies section, a key feature of this intervention may have been the inclusion of vouchers to local community members, as the evidence for the presence of supermarkets alone is mixed. For example, while the same older high-quality review suggested that inferences could be made that the availability of outlets that offer healthy choices will improve the diet of surrounding communities, a recent medium-quality review found no significant effect on the consumption of fruit and vegetables from opening a supermarket in a previously underserved area.(8) As well, another older medium-quality review found that out of 23 population-level interventions targeting low-income populations to promote fruit and vegetable intake that were implemented in different settings (e.g., supermarkets, worksites and healthcare settings), only five were found to be cost-effective, and even these interventions could only avert 5% of the disease burden attributable to insufficient fruit and vegetable consumption.(17) All but two of the interventions in this review were able to avert less than 1% of the total health burden, suggesting that overall, such initiatives are not likely to be cost-effective.(17)

*Improving the nutritional quality of the food supply*

The focus of the fifth population-level policy instrument is on improving the quality of the food that is available by working with industry to influence the use of select ingredients or by providing incentives for the farming and distribution of healthy foods. This may include:

- implementing threshold limits on the quantity of select ingredients;
- providing incentives to remove trans fats from foods; or
- encouraging community gardening, farms, community food production and supply-chain incentives for food production.

We found four systematic reviews (one recent high quality, one older high quality and two older low quality) (13; 16; 21; 24) and four primary studies (42; 44; 47; 49) that addressed this policy instrument.

One older low-quality review and three primary studies found that regulating the quantity of salt content by establishing thresholds for processed food is consistently cost-effective and cost-saving across different country contexts.(16; 44; 47; 49) Two of the primary studies estimated, based on a simulation, that a reduction in salt intake would result in an increase of quality-adjusted life years of between 235,000 and 1.3 million.(47; 49) Another primary study used data from the Ontario Health Insurance Plan in Canada from 2001 to 2003 to examine blood pressure values and physician and laboratory costs, and found that reductions in sodium intake set at 1840 mg/day (based on the Canadian Heart Health Survey data) were expected to reduce blood pressure by 5/2 mm Hg.(42) These findings were supported by findings from an older low-

quality review which included one observational study that found the reduction of salt through mandatory regulation in Denmark resulted in an average decrease from 9.5 grams per capita per day in 2001 to 8.6 grams per capita per day in 2007.(13)

One recent high-quality review also examined the effects of a trans-fat ban in take-away foods and found that while it reduced consumption of trans fats, an increase in consumption of saturated fats was also observed.(21)

Finally, one older high-quality review suggested that encouraging community gardening and providing agricultural subsidies for supplying healthy foods may be effective in improving diet and healthy eating.(24)

*Implementing or modifying standards for food available in public institutions*

Finally, the focus of the sixth population-level policy instrument is on adjusting the quality of food available in public institutions such as schools and hospitals. This may include:

- restrictions on portion sizes;
- food procurement policies;
- vending machine policies; or
- drinking water policies in schools, hospitals, universities or municipal governments.

We found four systematic reviews (one older high quality, one recent medium quality, one older medium-quality and one older low quality)(11; 13; 23; 24) and one primary study that addressed this policy instrument.(41)

One older medium-quality systematic review and one primary study provided evidence on cost-effectiveness. The systematic review examined workplace interventions to improve diet and physical activity, focusing on modifications to the workplace environment to encourage healthy eating such as changing what is offered in the cafeteria or in vending machines, and increasing employee participation in physical activity. The review found that these combined health-promotion programs resulted in improvements in weight reduction, and that the range of cost-effectiveness for these programs was between \$1.44 and \$4.16 per pound of body weight loss. (11) Although the review discussed challenges in interpreting these findings due to methodological considerations, it identified one study which sustained a 10% reduction in body weight that corresponded to significant reductions in the lifetime burden of hypertension, heart disease, hypercholesterolemia and stroke.(11) Overall, it was found that such worksite interventions were cost-effective. In addition, one primary study reported that the cost of implementing healthy canteens, whereby workplace cafeterias use existing capacity to supply employees with healthy packaged meals to take home, outweighed the projected direct and indirect benefits, and therefore was not considered cost-effective.(41)

Three systematic reviews addressed the effectiveness of these policy options, with one older low-quality review reporting that the provision of free fruit at schools and the regulation of nutritional content of school meals improve healthy eating behaviour in the short term.(13) However, compensating behaviour outside of school was not evaluated. Mixed findings were reported in three systematic reviews on the effects of controlling or banning sales of less healthy food in school vending machines.(13; 23; 24) Two reviews (one recent medium quality and one older low quality) found this intervention in students supported decisions to replace their food choices with healthier options, and increased their likelihood of meeting recommended amounts of fruits and vegetables.(13; 23) However, one older high-quality systematic review found limited evidence that these restrictions result in changes to students' diet.(24)

**Table 1. Key findings on the cost-effectiveness and effectiveness of population-level instruments to promote healthy eating**

Population-level instruments	Policy options	Key findings
Regulating marketing of unhealthy foods	<ul style="list-style-type: none"> <li>Restricting marketing of less healthy foods to adults and children</li> <li>Increasing the marketing of healthy alternatives through media campaigns</li> <li>Regulating health or nutrition claims</li> </ul>	<p><i>Key findings related to costs or cost-effectiveness of policy options</i></p> <ul style="list-style-type: none"> <li>Two primary studies included in one older medium-quality systematic review reported that putting up informational flyers in cafeterias to promote healthy food choices was cost-effective, with a cost-effectiveness ratio of US\$47,000 per DALY,(17) while another primary study found a combined approach of paid advertising and media campaigns was a cost-effective intervention to support a switch to one per cent or skim milk.(52)</li> <li>An OECD report found that neither self-regulation or imposed regulation on advertising is cost-effective, with estimates at US\$300,000 per DALY in the short term.(34) <ul style="list-style-type: none"> <li>However, a steep drop is observed in both cost-effectiveness ratios, falling below the accepted threshold of US\$50,000 per DALY, 20 years following implementation for self-regulation on advertising and 35 years for imposed regulations.</li> </ul> </li> <li>Similarly, one older low-quality review found regulation of TV advertising of unhealthy foods to children was cost-effective (fell under a \$50,000 Australian per DALY) and cost-saving in Australia, resulting in a net saving of \$299 million Australian.(14) <ul style="list-style-type: none"> <li>However, the review noted that this did not include the cost of changing regulations, additional food costs for families to switch consumption habits, or the impact on revenue streams of advertising companies.</li> </ul> </li> <li>One older medium-quality review found bans on advertising unhealthy food to children was cost-effective in the U.K. and Mexico, with an incremental cost-effectiveness ratio (ICER) under US\$5,000 per DALY, and cost-saving in Australia.(22)</li> <li>One primary study found that the majority of policy interventions were cost-saving and had incremental cost-effectiveness ratios of below \$6,000 Australian per DALY.(36)</li> </ul> <p><i>Additional key findings related to benefits and harms of policy options</i></p> <ul style="list-style-type: none"> <li>One older low-quality review of policies that have been implemented across European and comparator countries found that the effect of implementing a ban on marketing to children in Quebec beginning in the 1980s has resulted in a 7.1% to 9.3% drop in the probability of purchasing fast food, translating into an annual drop of 11 to 22 million fast-food meals purchased.(13) <ul style="list-style-type: none"> <li>Apart from this finding in Quebec, the same review reported that while bans have led to a reduction in children's exposure to advertising, there has been relatively little effort to measure other relevant outcomes such as effects on health and diet.</li> <li>However, one recent medium-quality review found strong relationships between marketing practices and changes in food preference, including for the targeted promotion of low-fat food options.(12)</li> </ul> </li> <li>One primary study examined changes in food consumption habits in young children based on advertising trends on television and found that increases in television advertising for certain foods and beverages increased children's tendency to consume those items (e.g., a 100% increase in advertising for carbonated</li> </ul>

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		soft drinks correlated with a 6.5% increase in children's consumption of these beverages, and a 1.3% increase in consumption in response to fast-food advertising).(37)
Modifying the labelling of foods and beverages	<ul style="list-style-type: none"> <li>• Menu labelling</li> <li>• Front of pack labelling</li> <li>• Calorie/nutrient/ingredient labelling</li> <li>• Warning labels</li> </ul>	<p><i>Key findings related to costs or cost-effectiveness of policy options</i></p> <ul style="list-style-type: none"> <li>• A recent OECD report estimated the cost-effectiveness ratio of implementing food labelling interventions in Canada falls below US\$50,000 per DALY 10 years following implementation (a cost that is reported as being acceptable in most OECD countries).(34)</li> <li>• One older medium-quality systematic review found the adoption of mandatory labelling schemes was cost effective in the U.K. with an ICER of US\$5,282 per DALY, and cost-saving in Australia and Mexico.(22)</li> <li>• Similarly, one primary study found implementing a traffic-light labelling system (with an assumed 10% shift in consumption) was cost-effective and cost-saving in Australia, with a cost-effectiveness ratio of \$1,800 Australian per DALY averted.(46)</li> </ul> <p><i>Additional key findings related to benefits and harms of policy options</i></p> <ul style="list-style-type: none"> <li>• Two recent medium-quality reviews examined the effectiveness of self-regulation on labelling of unhealthy food and found that self-regulation initiatives tend to be based on voluntary participation with industry input into the standards set, often resulting in restrictions that are vague and have a small measurable effect.(20; 27)</li> <li>• Two high-quality reviews (one recent and one older), one recent medium-quality review and one recent low-quality review found that there is limited evidence that labelling and information approaches result in a meaningful effect on dietary behaviours, and while a number of studies use self-reported data to show short-term changes in decision-making, these trends are not observed in other types of studies or over the long term.(15; 21; 23; 24) <ul style="list-style-type: none"> <li>○ However, the reviews suggest that the use of simple icons, checklists and logos of highly influential organizations such as the American Heart Association at the point-of-purchase may support dietary changes when combined with additional environmental changes.(15; 21; 24)</li> </ul> </li> <li>• One recent high-quality systematic review found that labelling caloric content of restaurant menu items would help reduce the average caloric content purchased per meal by 7.8%; however the evidence for this finding was of low to very-low quality.(18)</li> </ul>
Adjusting the price of food	<ul style="list-style-type: none"> <li>• Taxes</li> <li>• Subsidies to promote healthy eating</li> <li>• Food-related income support</li> <li>• Financial or other support for/from insurance companies, employers, health professionals who promote/prescribe healthy diets</li> </ul>	<p><i>Key findings related to costs or cost-effectiveness of policy options</i></p> <ul style="list-style-type: none"> <li>• One older high-quality review found fiscal measures, including taxation of unhealthy foods or subsidization of healthy foods, had a probability of 100% of being cost-effective and cost-saving in Australia, the U.K. and Mexico.(22)</li> <li>• One primary study found the implementation of a 10% junk food tax to be cost-effective and cost-saving, with a cost-effectiveness ratio of \$30 Australian per DALY averted.(46)</li> <li>• One review of policies and two primary studies suggest that subsidies for healthy foods tend to be more effective and cost-effective in promoting healthy eating than the use of taxes.(13; 39; 43) <ul style="list-style-type: none"> <li>○ However, in a few of the simulations examined, an increase in unhealthy foods was reported following the implementation of subsidies as the budget savings can be allocated to unhealthy food.(13)</li> <li>○ One of the primary studies found that among low-income consumers a price subsidy for healthy food is more cost-effective in curtailing consumption deficiencies than expanding the amount of money provided under the food stamps program.(43)</li> </ul> </li> </ul>

		<ul style="list-style-type: none"> <li>• One primary study found the expansion of a 30% rebate on healthy foods purchased through food stamp programs was cost-effective with an ICER ratio of US\$16,172 per quality adjusted life year (QALY) gained.(35)</li> <li>• One older-medium-quality review included a study that modelled a fruit and vegetable subsidy that resulted in a 1% reduction in price and predicted a reduction of 6,733 cases of coronary heart disease and 2,946 cases of ischemic stroke avoided in the U.S., at an average cost of US\$1.29 million per life saved.(29)</li> <li>• One older medium-quality review found that the provision of vouchers to increase fruit and vegetable consumption (both at supermarkets and farmers' markets) was not cost-effective, with cost-effectiveness ratios of two interventions ranging between US\$270,000 and US\$2.5 million USD per DALY.(17)</li> <li>• One primary study compared the implementation of an information campaign to two price interventions, one on reducing value-added taxes on fruits and vegetables and the other on providing a 100-euro voucher to low-income consumers, and found the cost-to-life-years-saved ratio was lowest for the information campaign (3,000 euros), followed by value-added tax reduction (99,000 euros) and food stamp policy (403,000 euros).(38) <ul style="list-style-type: none"> <li>○ The study also found that the reduction in value-added tax increases health inequalities between income groups, whereas the food stamp policy was found to reduce health inequalities.(38)</li> </ul> </li> <li>• One primary study found that a value-added-tax reduction would lead to a 1.8% decrease in consumer price, but that this would benefit low-income consumers less than other consumers and would marginally increase the health disparity index in France.(38) <ul style="list-style-type: none"> <li>○ Fruit and vegetable stamps were found to reduce disparities between low-income consumers and higher-income consumers at the cost of only a very small increase in consumption.(38)</li> </ul> </li> </ul> <p><i>Additional key findings related to benefits and harms of policy options</i></p> <ul style="list-style-type: none"> <li>• All systematic reviews and primary studies examining changes in price, including one book, three recent reviews (one high and two medium quality), five older systematic reviews (two lower, one medium and one high quality) and two primary studies found that taxing unhealthy foods resulted in a reduction in the consumption.(9; 21; 24-26; 29; 30; 32; 45; 51) <ul style="list-style-type: none"> <li>○ One recent medium-quality review found that while the taxing of single nutrients reduced the overall level of consumption, substitution effects were observed with other unhealthy nutrients (e.g., replacing high-salt content with high-sugar content).(28)</li> <li>○ One primary study found that taxing unhealthy beverages (particularly sugar-sweetened beverages) is more effective on a per-calorie than per-ounce basis, while another suggested that a tax on producers (rather than a final tax on consumers) targets sweeteners directly and leads to less of a loss in consumer surplus (i.e., the difference between what consumers are willing and able to pay and the amount they actually pay).(45; 51)</li> <li>○ One older low-quality review on the effects of food subsidies and taxes found that a 10% decrease in price (subsidy) increased consumption of fruits and vegetables by 12%, whereas a 10% increase in price (tax) decreased consumption of unhealthful foods by 6%.(29)</li> <li>○ Two recent medium-quality and three older reviews (one low, one medium and one high quality), found that the larger the tax increase, the greater response in curbing consumption, with most</li> </ul> </li> </ul>
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		<p>evidence suggesting a tax over 20%, which when applied to sugar-sweetened beverages is estimated to reduce the prevalence of obesity by 3.5% in the U.S.(9; 24-26; 29; 30)</p> <ul style="list-style-type: none"> <li>○ However, the older low-quality review found that taxes would have to be very high, suggesting over 50% to have an impact on body weight or body mass index,(29) while the recent medium-quality review found that specific taxes (e.g., those that apply a fixed value based on the quantity, size or weight of the product) are more effective than ad valorem taxes (e.g., proportional to price).(30)</li> <li>● One recent medium-quality review examined the impact of taxing manufacturers to change the use of specific raw materials and found mixed results. Specifically, modelling studies included in the review showed that manufacturers responded by passing the increased price down to consumers or by suppressing supply of the product, while one study of a policy implemented in Hungary found that manufacturers made significant changes in response to the implementation of the tax.(30)</li> <li>● One older medium-quality systematic review and one primary study examined price elasticity of unhealthy and healthy foods and beverages in the U.S., and found food purchased away from home and soft drinks to be the most elastic, at 0.81 and 0.79 respectively, while fats and oils, and sweets and sugar were 50% elastic, at 0.48 and 0.34 respectively.(40; 53) <ul style="list-style-type: none"> <li>○ The same review also evaluated the cross-price elasticity of milk with varying fat contents and found that a 10% increase on two per cent milk resulted in between 0.6 and 5% increase in purchases of low-fat (1%) milk and between 0.1 and 2.9% increase in purchases of skim milk.(53)</li> <li>○ However, one recent medium-quality system review estimated a significantly higher price elasticity of 1.21, but found a similar level of elasticity for soft drinks specifically at 0.86.(26)</li> </ul> </li> <li>● An older, low-quality review and two recent medium-quality reviews found that subsidies for targeted foods have a positive effect on the purchase and consumption of healthy foods, with a larger discount resulting in a larger effect.(8; 9; 28) <ul style="list-style-type: none"> <li>○ On average a 10% subsidy for healthy foods resulted in a 12% increase in the consumption of healthy foods, observing an average 14% increase in consumption of fruits and vegetables but no significant change in the consumption of healthy beverages (e.g., water, low-fat milk).(9)</li> <li>○ The increased consumption of fruits and vegetables resulted in a small but significant reduction in Body Mass Index (BMI).(9)</li> <li>○ However, one high-quality systematic review found no change in body weight or BMI from the provision of a \$2,000 increase in food stamps.(54)</li> </ul> </li> <li>● One older medium-quality review and one primary study noted that in addition to influencing choice, pricing policies may reinforce consumer education by drawing awareness to which products are being taxed or subsidized, or can reinforce purchasing appropriate portion sizes.(29; 48)</li> </ul>
Creating a healthy retail and food-service environment	<ul style="list-style-type: none"> <li>● Incentives and rules to reduce less healthy food and ingredients in food-service outlets</li> <li>● Incentives to increase the availability of healthy foods</li> </ul>	<p><i>Key findings related to costs or cost-effectiveness of policy options</i></p> <ul style="list-style-type: none"> <li>● No systematic reviews or primary studies were identified</li> </ul> <p><i>Additional key findings related to benefits and harms of policy options</i></p> <ul style="list-style-type: none"> <li>● One recent high-quality review found that changing the content of pre-packaged children's meals reduced the overall quantity of calories purchased, increased purchases of non-fat chocolate milk, and resulted in a slight decrease in the purchase of regular carbonated drinks.(21)</li> </ul>



	(e.g., changes to choice architecture)	<ul style="list-style-type: none"> <li>The same recent high-quality review found that working with food-service outlets to increase the availability of healthy foods, either by providing incentives or by developing educational materials, resulted in small improvements in healthier options and an increased distribution of educational material.(21) <ul style="list-style-type: none"> <li>However, the review noted that when incentives were provided to outlets, the level necessary to achieve the award was set quite low and a higher threshold should be explored.(21)</li> </ul> </li> </ul>
Promoting access and availability of healthy foods	<ul style="list-style-type: none"> <li>Urban planning and land use policies</li> <li>Zoning bylaws</li> <li>Density, vicinity and restrictions of food outlets to schools</li> <li>Incentives for stores/supermarkets to locate in underserved neighbourhoods</li> </ul>	<p><i>Key findings related to costs or cost-effectiveness of policy options</i></p> <ul style="list-style-type: none"> <li>Another older medium-quality review found that out of 23 population-level interventions targeting low-income populations to promote fruit and vegetable intake that were implemented in different settings (e.g., supermarkets, worksites and healthcare settings), only five were found to be cost-effective, and these interventions could only avert 5% of the disease burden attributable to insufficient fruit and vegetable consumption. All but two of the interventions in this review were able to avert less than 1% of the total health burden, suggesting that overall, such initiatives are not likely to be cost-effective.(17)</li> </ul> <p><i>Additional key findings related to benefits and harms of policy options</i></p> <ul style="list-style-type: none"> <li>One older high-quality review found that while evidence remains limited, the use of agricultural subsidies to create infrastructure, production, transportation and marketing of healthier foods may have a significant long-term impact on improving the availability of healthy foods.(24)</li> <li>One older high-quality review included one study which found the presence of local farmers' markets that included vouchers for the local community led to increased consumption of fruits and vegetables, and a learning opportunity and exposure to fresh foods for children.(24)</li> <li>The same older high-quality review examined the literature on local store availability and found that while the literature is larger cross-section (and therefore difficult to draw generalizations from) some inferences can be made that the availability of outlets that offer healthy choices will improve the diet of the surrounding communities, and potentially lead to reduction in body weight and body mass index.(24) <ul style="list-style-type: none"> <li>However, one recent medium-quality review included a study that found no significant effect on the consumption of fruit and vegetables from opening a supermarket in a previously underserved area.(8)</li> </ul> </li> </ul>
Improving nutritional quality of food supply promoting healthy food choices	<ul style="list-style-type: none"> <li>Threshold limits on the quantity of select ingredients</li> <li>Incentives to remove trans fats from food</li> <li>Encourage community gardening, farms, community food production, and supply-chain incentives for food production</li> </ul>	<p><i>Key findings related to costs or cost-effectiveness of policy options</i></p> <ul style="list-style-type: none"> <li>One older low-quality review found that regulation of salt content in processed foods is consistently cost-effective (according to WHO thresholds whereby cost-effectiveness ratio is under three times the GDP per capita) and cost-saving across country contexts, and using different methods.(16)</li> <li>Four primary studies found that interventions to reduce salt intake, either by working with industry or by setting thresholds on select ingredients, were highly cost-effective. <ul style="list-style-type: none"> <li>One primary study estimated that reducing salt intake by 1.0 g per day and replacing one energy per cent of saturated fat with polyunsaturated fat could significantly reduce the rates of cardiovascular disease in the adult Finnish population, and was cost-saving of up to 225 million euros (44)</li> <li>Another study found a reduction in sodium increased QALYs by 1.3 million and saved US\$32.1 billion in medical costs over the lifetime of U.S. adults aged 40 to 85.(47)</li> <li>The third study found that setting a mandatory 35% reduction in sodium content in all packaged foods, fast foods and restaurant meals would result in a net gain of 235,000 QALYs.(49)</li> <li>The fourth study found that reductions in sodium intake set at 1840 mg/day (based on the Canadian Heart Health Survey data) were expected to reduce blood pressure by 5/2 mm Hg, managing</li> </ul> </li> </ul>

		<p>hypertension through this intervention would reduce annual health spending for hypertension in Canada by up to \$430 million/year, and an additional cost-savings of \$108 million/year was anticipated through reduced spending on physician and laboratory services.(42)</p> <p><i>Additional key findings related to benefits and harms of policy options</i></p> <ul style="list-style-type: none"> <li>• One review on the policies that have been implemented in Europe to curb obesity found that the reduction of salt through mandatory regulation in Denmark has resulted in an average decrease from 9.5 g per capita per day in 2001 to 8.6 g per day in 2007.(13)</li> <li>• One older high-quality review found that school-based approaches including school-based gardening were effective in improving diet and physical activity.(24)</li> <li>• One recent high-quality review found that implementing a trans-fat ban in take away foods resulted in a reduction in the consumption of trans fats but an increase in consumption of saturated fats.(21)</li> </ul>
Require standards for food available in public institutions	<ul style="list-style-type: none"> <li>• Restrictions on portion sizes</li> <li>• Food procurement policies</li> <li>• Vending machine policies</li> <li>• Drinking water policies in schools, hospitals, universities, and municipal governments</li> </ul>	<p><i>Key findings related to costs or cost-effectiveness of policy options</i></p> <ul style="list-style-type: none"> <li>• One older medium-quality systematic review found that health-promotion programs at the workplace which integrated diet (e.g., changing what is available at workplace cafeterias or in vending machines) and physical activity resulted in improvements in weight reduction, and that the range of cost-effectiveness for these programs was between \$1.44 and \$4.16 per pound of body weight loss. The review suggests that such interventions are likely cost-effective.(11)</li> <li>• One primary study found that the implementation of healthy canteen takeaways, whereby workplace cafeterias use existing capacity to supply employees with healthy packaged options to take home, was not cost-effective as the estimated costs of running the canteen outweighed the projected direct and indirect benefits.(41) <ul style="list-style-type: none"> <li>○ However, while the study does not suggest full scale-up of this model, it does note that this may be an option to improve the average nutritional quality of employees for select workplaces.(41)</li> </ul> </li> </ul> <p><i>Additional key findings related to benefits and harms of policy options</i></p> <ul style="list-style-type: none"> <li>• One review on policies that have been implemented in Europe found that measures to control vending machines in schools, the provision of free fruit at schools and the regulation of the nutritional content of school meals show a positive effect on behaviour in the short term, however most evaluations have not considered possible compensating behaviour outside of school.(13)</li> <li>• One older high-quality review found limited evidence on restrictions on accessibility of school vending machines in improving diet.(24)</li> <li>• However, another recent medium-quality review found that banning sugar-sweetened beverages from vending machines and replacing them with healthier options resulted in a reduction in low nutrient-dense foods and an increase in meeting recommendations for fruit, vegetables and milk.(23)</li> </ul>

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## APPENDICES

The following tables provide detailed information about the systematic reviews and primary studies identified in the rapid synthesis. The ensuing information was extracted from the following sources:

- systematic reviews - the focus of the review, key findings, last year the literature was searched, and the proportion of studies conducted in Canada; and
- primary studies (in this case, economic evaluations and costing studies) - the focus of the study, methods used, study sample, jurisdiction studied, key features of the intervention and the study findings (based on the outcomes reported in the study).

For the appendix table providing details about the systematic reviews, the fourth column presents a rating of the overall quality of each review. The quality of each review has been assessed using AMSTAR (A MeaSurement Tool to Assess Reviews), which rates overall quality on a scale of 0 to 11, where 11/11 represents a review of the highest quality. It is important to note that the AMSTAR tool was developed to assess reviews focused on clinical interventions, so not all criteria apply to systematic reviews pertaining to delivery, financial or governance arrangements within health systems. Where the denominator is not 11, an aspect of the tool was considered not relevant by the raters. In comparing ratings, it is therefore important to keep both parts of the score (i.e., the numerator and denominator) in mind. For example, a review that scores 8/8 is generally of comparable quality to a review scoring 11/11; both ratings are considered “high scores.” A high score signals that readers of the review can have a high level of confidence in its findings. A low score, on the other hand, does not mean that the review should be discarded, merely that less confidence can be placed in its findings and that the review needs to be examined closely to identify its limitations. (Lewin S, Oxman AD, Lavis JN, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP): 8. Deciding how much confidence to place in a systematic review. *Health Research Policy and Systems* 2009; 7 (Suppl1):S8).

All of the information provided in the appendix tables was taken into account by the authors in describing the findings in the rapid synthesis.

**Appendix 1: Summary of findings from systematic reviews about population-level approaches to promote healthy eating**

Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
Systematic review	The relation between food price changes and food-purchasing patterns (19)	<p>The review included 30 studies, 23 of which are interventional studies and seven prospective cohort studies. The results of a pooled analyses found a 10% decrease in price (i.e., subsidy) increased consumption of healthful foods by 12%, whereas a 10% increase in price (i.e., tax) decreased consumption of unhealthful foods by 6%.</p> <p>The subsidy resulted in an increased intake of fruits and vegetables by 14%, but had no significant effect on consumption of healthful beverages. Price increases were found to have the opposite effect with a 7% reduction in beverages and a 3% reduction in fast foods consumed.</p> <p>Finally, the review found that while changes in the price of fruit and vegetables (and the associated increase in consumption) reduced body mass index, price changes for unhealthy foods or beverages did not significantly alter body mass index.</p>	2011	3/9 (AMSTAR rating from McMaster Health Forum)	Not reported
Systematic review	To assess the effect of food taxes and subsidies on diet, body weight and health through a systematic review of the literature (29)	<p>The review included 24 studies that examined the effects of fiscal policies, such as taxes and subsidies on healthy food consumption, body weight and body mass index (BMI).</p> <p>The review found that fiscal policies have a significant effect on the consumption of foods. However, the majority of the literature included were modelling studies, with a minority based on observation, and as such may over-estimate the effect on individuals' choices. Included studies found that while taxes have the potential to influence the body weight and BMI of individuals, they would have to be significantly larger than most jurisdictions are proposing, with select studies showing the need for them to be above 50%.</p> <p>In addition to influencing choice, the review found that taxes may help to educate consumers on healthy choices by drawing awareness to products that are taxed. One study included in the review found that this was most effective when accompanied by warning labels.</p> <p>The review also examined the potential regressivity of taxes and found mixed results about whether the health benefits and greater health gains among low-income consumers outweighed the disproportionate burden placed on families who do not reduce their consumption.</p>	2009	6/10 (AMSTAR rating from McMaster Health Forum)	0/24
Systematic review	The effectiveness of specific policies and programs promoting healthy eating in Europe (13)	<p>Public policies and campaigns to promote fruit and vegetable consumption are common across Europe and have been found to increase knowledge and awareness, but have not had positive effects on nutritional intake or health markers in the public. Nutritional labelling and symbols on packaging both improves consumer awareness and encourages companies to produce healthier products.</p> <p>Low-level taxation of unhealthy foods was found to have little impact on consumer behaviour, but can generate revenue to fund other health initiatives. Product reformulation, through regulation of food standards or voluntary industry measures, was found to be effective for reducing intakes of unhealthy ingredients.</p>	Not reported	3/9 (AMSTAR rating from McMaster Health Forum)	Not reported



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Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
Systematic review	The effectiveness of population approaches to improve dietary habits, increase physical activity, and reduce tobacco use (24)	<p>The review examined system-level policy interventions to curb preventable deaths due to poor lifestyle. Specifically, interventions were grouped in six categories: 1) media and education campaigns; 2) labelling and consumer information; 3) taxation, subsidies, and other economic incentives; 4) school and workplace approaches; 5) local environmental changes; and 6) direct restrictions and mandates.</p> <p><i>Media and education campaigns</i> The review found that generally media and education campaigns are effective at improving the knowledge of consumers. Mixed results were found with respect to whether these campaigns resulted in sustainable behavioural change. However, the review found that these campaigns are most effective when they are focused on specific foods, implemented over long periods of time, use multiple channels of communication, and when shorter term, incorporate public participation.</p> <p><i>Labelling and consumer information</i> The review found relatively little evidence to support the use of labelling and information as an effective means of changing the dietary habits of consumers. However, there have been some positive findings from self-reported studies. Labelling and information interventions were most effective when implemented alongside other environmental changes such as simple icons, checklists and economic incentives.</p> <p><i>Taxation, subsidies and other economic incentives</i> Findings suggest that changes to the price of foods and beverages significantly alter their consumption, with higher tax rates resulting in larger changes in consumption habits. The review also found that larger effects are observed among lower socio-economic groups, who are more sensitive to price than high-income consumers.</p> <p><i>School and workplace incentives</i> The review supported the use of multi-component school-based interventions, particularly when they included aspects of community participation. There was also some evidence that changes to the environment were also effective, for example, restricting access to vending machines, provision of filtered water, and greater availability of healthy food choices.</p>	2011	7/10 (AMSTAR rating from McMaster Health Forum)	Not reported
Systematic review	The effectiveness of grocery store interventions in relation to obesity (8)	<p>The review examined 42 studies focusing on single-strategy interventions, including accessibility/availability, price/affordability, and information intervention, as well as multi-intervention studies, including combined information and access/availability, combined monetary incentives and information, combined affordability and availability, and a combination of all three intervention types.</p> <p>Economic incentives, such as price reductions, were found to be effective in increasing the sales and consumption of healthy food. The combination of information and accessibility elements was found to positively affect the outcome measures, while the elements on their own demonstrated mixed to</p>	2015	7/10 (AMSTAR rating from McMaster Health Forum)	4/42

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Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		zero effects. The combination of all three intervention types also demonstrated positive results. Mixed results were found in regard to the combination of monetary incentives and information.			
Systematic review	The effects of food pricing on dietary consumption (9)	The review examined 30 studies focusing on interventions for dietary consumption. The most effective price interventions on dietary consumption was the use of subsidies and combined multi-component interventions.  Specifically, a decrease in food pricing using subsidies was found to result in an increased consumption of healthful foods. A similar inverse relationship was seen with an increase in food pricing.	2014	4/10 (AMSTAR rating from McMaster Health Forum)	0/30
Systematic review	The effects of fiscal interventions on consumption of food and health outcomes (10)	The review included 18 studies examining the effects of fiscal interventions on the consumption of taxed and subsidized food. Data were collected from countries with varying income levels (high, middle, low).  In high-income countries, the use of taxes and subsidies was found to be positively associated with food consumption, but demonstrated a minimal effect on anthropometry. In both upper middle-income and lower middle-income countries, a predicted effect between subsidies on food consumption and anthropometry was evident.  Despite these findings, more research should be collected in regard to these interventions and their effects.	2013	8/10 (AMSTAR rating from McMaster Health Forum)	0/18
Systematic review	Effectiveness of worksite nutrition and physical activity interventions for controlling employees' weight (11)	The review included 47 studies that focused on health-promotion programs at work addressing diet and/or physical activity.  Generally, the nutrition and physical-activity programs resulted in small improvements in weight status in the medium (six months) and long (12 months) terms. Participants averaged a reduction of 2.8 pounds and a 0.5 reduction in body mass index (BMI).  Three studies of the 47 examined the cost-effectiveness of the programs and found that the range of cost-effectiveness varies from \$1.44 to \$4.16 per pound of loss in body weight. The review discusses the challenges of interpreting these results, as the economic burden on the health system per pound of additional weight is not well estimated. The review however, refers to one study which found that a sustained reduction of 10% in body weight would significantly reduce the lifetime likelihood of hypertension, hypercholesterolemia, Type 2 diabetes, coronary heart disease, and stroke by \$3,258 for men and \$3,116 for women. Given the cost of \$1.44 per pound of weight loss, these interventions are likely cost-effective.	2005	5/9 (AMSTAR rating from McMaster Health Forum)	Not reported
Systematic review	Cost-effectiveness of health taxes to promote healthy eating (30)	The review included 102 studies that focused on the use of taxes to disincentivize the consumption of substances including tobacco, alcohol, soda and unhealthy food. The review examined a number of thematic areas including: change to consumption behaviours; health impacts of health taxes; impact on manufacturers' and retailers' behaviour; potential for revenue generation; and public perception of health taxes.	2016	4/10 (AMSTAR rating)	Not reported

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Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>For the first thematic area – change to consumption behaviours – the most common application of health taxes was on soft drinks, cordials and other sugar-added juices. The review found that there is considerable evidence to suggest that health taxes have a positive effect on reducing the consumption of unhealthy beverages and food. The review cautions this finding however, noting that the majority of evidence in this area is based on modelling or evaluation studies of hypothetical taxes. The evidence is strongest for the implementation of a health tax set at 20% or more of the price of the good. Three studies included in the review found that specific taxes (e.g., those that apply a fixed value based on the quantity, size or weight of the product) are more effective than ad valorem taxes (e.g., proportional to price).</p> <p>For the second thematic area – impact on the behaviour of manufacturers and retailers - included studies focused on applying a tax on manufacturers to change the use of specific raw materials. Three studies were identified that considered this approach and found varied results. Modelling studies found that when a tax was applied to specific ingredients, manufacturers responded by increasing the price of the finished good or by suppressing supply (and increasing price). However, one study in Hungary found that such a tax resulted in significant changes made to the manufacturing of products. The study suggested that this may have been from taxing products that contained an ingredient above a certain threshold.</p> <p>The third thematic area focused on taxes’ ability to generate additional revenue. The review found that while generally the literature confirms that the implementation of taxes results in additional revenue, it may be subject to significant variation, particularly over long periods of time. This is due to a change in consumption habits, whereby individuals stop purchasing the product or replace the product with another and decrease the tax revenues as a result.</p> <p>The fourth thematic area – degree of support among public policy communities for health taxes – found that generally the public support for the implementation of new taxes is low. However, case studies from countries that have successfully implemented health taxes have shown that orienting the messaging of the tax around health promotion, rather than revenue generation, may help to put the tax on the government agenda.</p> <p>Criticisms of health taxes, the fifth thematic area, are largely centred around the disproportional impacts of levying a health tax on lower socio-economic and other marginalized groups. The review notes that available literature does not sufficiently address where low-income groups are disproportionately burdened by taxes, or whether their demand for these goods shifts significantly enough so as to move the burden to the higher-income groups. Other proponents of the health taxes have argued that revenue could be used to subsidize healthy foods or put towards initiatives that would reduce the challenges of accessing healthy foods in low-income areas. The final criticism of health taxes is that they are often set at a low percentage to ensure stable revenue, but this does not provide enough of an incentive to change behaviour.</p>			

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Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
Systematic review	Effectiveness of the self-regulation of food and beverage marketing (27)	<p>The review included 22 studies focused on the self-regulation of industry regarding food and beverage marketing and nutrition labelling.</p> <p>The review found that self-regulation initiatives tend to be based on voluntary participation, where companies have input into the standards and benchmarks of the regulation. Generally, this results in restrictions that are often vague and quite permissive, and the measureable effect of these tends to be small.</p>	2013	4/9 (AMSTAR rating)	Not reported
Systematic review	Effects of changes to policy and the built environment to obesity, physical activity and nutrition labelling (23)	<p>The review included 37 studies that examined policy and built-environment changes on reaching obesity prevention targets. Specifically, the review looked at effects on: 1) obesity, weight or BMI measurements; 2) physical activity; and 3) nutrition or diet.</p> <p>The studies focused on obesity, weight or BMI measurements found little effect from either the receipt of food stamps or built environment changes.</p> <p>Studies focused on physical activity found that increases in greenspace and in outdoor play or exercise produced mixed results, with one-half reporting improvements in total physical activity while the remaining reported switching from one activity to another as a result of the new amenities. Additional studies examined the use of active transportation interventions and found largely positive results, however, they were focused on use of active transportation instead of changes to overall physical activity.</p> <p>Finally, studies focused on nutrition labelling found that those which assessed impacts soon after implementation had no impact on food purchasing or on improving nutritional outcomes. Findings from studies that looked at the impact of regulatory improvements on restaurant food environments or school food environments reported improvements in purchases and self-reported food consumption. Similarly, studies focused on federal policy changes to the quality of food that could be purchased with low-income food vouchers resulted in improvements in diet, of fruits and vegetables consumption, and the use of farmers' markets.</p>	2014	4/10 (AMSTAR rating from McMaster Health Forum)	1/37
Systematic review	Effectiveness of limiting food and beverage advertising to children (20)	<p>The review included 21 studies focused on children's exposure to marketing before and after the introduction of government regulation or self-regulation on labelling and packaging of unhealthy food.</p> <p>Generally, papers included indicate that a reduction in exposure to unhealthy food is possible and was observed in studies from Quebec and from the U.K. However, in Quebec it was more effective among French-speaking children, and in the U.K. it resulted in an increased proliferation of advertisements for unhealthy food during adult programming.</p> <p>Pledges or voluntary self-regulation appear to be relatively ineffective, largely because competitors take over the advertising space that select members of industry give up in pledges.</p>	2013	5/10 (AMSTAR rating from McMaster Health Forum)	5/21

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Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		To date research has focused on TV advertising, however the review found that a redirection is needed as there is significant expenditure in other advertising markets such as online. This further raises concerns about the nature of regulations that are needed to control exposure of children to unhealthy food marketing and advertising.			
Systematic review	Examining interventions to improve the nutritional quality of ready-to-eat meals (21)	<p>The review included 34 interventions, with those that were most common being enabling healthy choice through sign posting, and providing consumers with information through calorie labelling. Generally, the interventions can fall into four categories: 1) restricting choice; 2) guiding choice; 3) enabling choice; and 4) providing information. The review aimed to determine the impact of these interventions on dietary outcomes, purchasing behaviour, and attitudes towards healthier menu choices and preferences, as well as the changes in retail practices, process outcomes and profit.</p> <p><i>Restricting choice</i> Two interventions were included in this category. The first was the implementation of a trans-fat law, which was associated with significant reduction in the trans-fat content per individual purchase, but was also associated with an increase in saturated-fat content. The second intervention was changing pre-packed children's meal contents. One study found that this reduced the overall quantity of calories purchased, increased non-fat chocolate milk purchase, and slightly decreased regular carbonated drinks.</p> <p><i>Guiding choice</i> This category focused on price increases or decreases in choices. For price increases, one study found a decrease in unhealthy main dishes ordered only when price increases were accompanied by sign posting of healthy options. Two studies found that price reductions for healthier choice, implemented either alone or alongside sign posting, resulted in an increase in sales of healthier items compared to other items. Another study found varied effects from the use of incentives to encourage healthy eating, with a larger switch observed towards a healthy option when a larger reward (non-food) was provided.</p> <p><i>Enabling choice</i> This category included sign posting of healthier or unhealthy options and telemarketing (e.g., offering support for the provision of healthier options to business via telephone). Generally, sign posting to improve healthy choices was effective, but when used alone (e.g., without price changes) had a greater impact on women. Another study found that sign posting aimed at increasing knowledge was most effective when it was image oriented and displayed as simple checklists.</p> <p><i>Providing information</i> The highest number of studies assessed the effects of mandatory calorie labelling on menus. Two of 10 studies found a decrease in the calories purchased, while the remaining eight reported no association between introduction of calorie labelling and average energy purchased. One study examined voluntary nutrient information and found that it resulted in significant decreases in energy fat and sodium content in purchases, but no change in carbohydrate content in purchases.</p>	2015	8/10 (AMSTAR rating from McMaster Health Forum)	0/34

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Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p><i>Food-outlet interventions</i></p> <p>Overall, seven studies examined the effects of interventions focused on food-outlet outcomes. Two studies found that while award schemes (where food outlets are provided with an award or certificate for implementing a number of interventions) resulted in improvements in healthier catering practices, the level of changes necessary to achieve the award was too low. One study on sign posting found that working with food outlets increased the distribution of education material or the availability of healthier side options.</p> <p>Generally, while a significant degree of inconsistency has been found across the interventions, interventions focused on restricting choice or 'health by stealth' interventions appeared to be most effective and equitable across the population. Further results from a sub-analysis show that the level of intrusiveness of an intervention is the predicting factor as to whether or not they are effective at either a consumer or food-outlet level.</p>			
Systematic review	Effects of food and beverage taxes and subsidies on body weight (26)	<p>The review examined the use of taxes to reduce obesity rates by targeting sugar-added beverages and fast food, along with incentives targeted to fruits and vegetable consumption. The review included 41 studies from the United States examining the effect of price on consumption (n=21) and body weight (n=20) outcomes.</p> <p>A previous review reported that on average, a 10% increase in price would reduce consumption of soft drinks (7.9%), food away from home (8.1%), fruits (7.0%) and vegetables (5.8%). However, more recent estimates believe that soft drinks and sugar-added beverages may be more price elastic than previously estimated.</p> <p>Outcomes for this review are reported in four categories: 1) sugar-added beverages demand; 2) fast food demand; 3) fruit and vegetable demand; and 4) weight outcomes.</p> <p><i>Sugar-added beverages</i></p> <p>Results from 10 studies found that sugar-sweetened beverages are more price elastic than previously thought, with a mean price elasticity of demand of -1.21. This finding means that a tax increase of 20% would reduce overall consumption by 24%. The price elasticity for individual types of beverage were found to be more elastic, a finding that the review indicates is consistent with economic theory as there is substitution between the sub-categories. For regular carbonated sodas, the price elasticity was estimated at -1.25, while an average elasticity of -2.44 and -1.40 was estimated for sports drinks and fruit drinks respectively. However, the price elasticity of soft drinks (sweetened with sugar as opposed to artificial sweetener) was inelastic at -0.86.</p> <p><i>Fast-food demand</i></p> <p>Only two of six studies reported price elasticity data and found an average mean elasticity of -0.52 which was lower than the food away from home estimate of -0.81 reported. However, higher</p>	2012	5/10 (AMSTAR rating from McMaster Health Forum)	Not reported

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Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>fast-food prices among children was associated with significantly lower consumption. This finding reversed when it was applied to adolescents.</p> <p><i>Fruit and vegetable demand</i> Of seven studies, five provided price estimates for fruits and vegetables consumption. The mean price elasticity for fruit and vegetables was -0.49 and -0.48 respectively.</p> <p><i>Weight outcomes</i> Overall, results from the 20 studies that focused on weight outcomes found mixed results for both beverages and food. The six recent studies found statistically insignificant associations with weight outcomes. However, one study found that higher fast-food prices were associated with a reduction in BMI among SNAP recipients. The remaining studies found mixed results for reducing adults' weight through subsidies for fruits and vegetables, but found significant effects for adult women, with long-term effects being particularly prominent for poor women and those with children. In particular, one study found that subsidies targeted at SNAP participants were more effective than those targeted at non-SNAP recipients.</p> <p>Generally, the evidence suggests that a tax that raises prices by 20% or more would reduce sugar-sweetened beverage consumption by 24%. However soft drink elasticity was less price elastic, and as these generally include diet alternatives of soft drinks this elasticity should not be used. The evidence suggests that an excise tax is more effective in raising prices when volume discounts are given, compared to sales taxes that generally are applied as a percentage of price. The evidence for fast-food suggests that a 20% increase in price would reduce consumption by about 10%. Regardless, it is thought that a tax could be useful given the extent of caloric intake from fast food.</p>			
Systematic review	Cost-effectiveness of interventions for curbing obesity in children and adolescents (14)	<p>The review modelled the cost effectiveness of 13 interventions implemented at a range of different levels including: primary care; hospital; school-based; neighbourhood or community; or media and marketing. The costs for the interventions varied significantly both in absolute terms and in cost per child. At the highest end of the spectrum for wide-spread application was \$130 million Australian for lap banding for adolescents who are severely obese, to \$1 million Australian for controlling television advertising of junk food.</p> <p>When cost offsets were included, the following interventions were all determined to be net-saving: multi-faceted school-based with physical activity; education to reduce carbonated drinks in schools; family-based targeted program for obese children; education program to reduce TV viewing; regulation of TV advertising; and targeted multi-faceted school-based programs. To be categorized as net-saving with high health impact meant achieving a cost-effectiveness of less than \$50,000 Australian per disability adjusted life years. When examined in terms of net cost per child however, three interventions performed well: Active After School Communities; TravelSmart; and education to reduce TV viewing.</p>	2009	3/10 (AMSTAR rating from McMaster Health Forum)	0/13

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Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		Reduction of TV advertising of high-fat and/or high-sugar foods to children was estimated to come out with a net saving of \$299 million Australian. However, this estimate does not include the cost of changing regulations, any additional food costs to families to switch food consumption habits, or the impact on revenue stream of advertising companies.			
Systematic review	Effects of food taxes and subsidies on diet (28)	<p>The review included 38 studies examining the effect of food taxes and subsidies on consumption. Of these, 30 studies modelled estimates of effect on the basis of a wide variety of data that measured consumer behaviour, while the remaining eight examined stated preferences of using surveys and online laboratory shopping experiences.</p> <p><i>Subsidies on healthy foods</i> Studies included in the review reported on subsidies that ranged from 1.8% to 50%, and all found an increase in consumption of targeted foods of at least half the magnitude of the tax applied. The effect on total calories consumption was less clear, showing results of between 1% and 17% reduction, with larger increases found for subsidies of between 10% and 30%.</p> <p><i>Sugar-sweetened beverages</i> Studies modelled the effects of taxes from 5% to 30%, all of which showed a reduction ranging from 5% to 48%. This demonstrated a response that was fairly proportional to the tax applied. Four studies found that in response to taxes of between 5% and 20% there was a significant reduction of caloric intake from these beverages, ranging from 10% to 48% among adults, and 5% to 8% for children. Three studies showed a reduction in all calories as a result of these taxes.</p> <p><i>Taxes on individual nutrients</i> Studies examined the impact of taxes on fat, sugar and salt of 5% to 40% and reduced consumption of the nutrient by 0% to 8%. Small increases (5% to 17.5%) may reduce the consumption of fat by 0% to 3% and is particularly effective on certain high-fat foods such as potato chips. Modelling studies found that sugar taxes of one euro per kilogram in Finland resulted in a 23% reduction, while a tax of US \$0.0003 per gram reduced consumption by 8%. Finally, a U.S. modelling study found that a sodium tax of 40% would reduce consumption by 6%. Only one study examined substitution effects and suggested that taxes on a single nutrient could increase the unhealthy consumption of another.</p> <p><i>Taxes based on nutrient profiling</i> Taxes ranged from 10% to 50% and all but one study found reductions from 6.5% to 30%.</p> <p>Studies examining the distribution of the cost burden of taxes by different groups found that the poor would pay more for unhealthy food, however the wealthy are those who are less price responsive in the long term. In addition, two modeling studies and one of individual states' preferences found that subsidies ranging between 3% to 30% may disproportionately benefit well-off households rather than assisting low-income households. Specifically targeting those fruit and</p>	2012	5/10 (AMSTAR rating from McMaster Health Forum)	0/38



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Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		vegetable subsidies to food stamp recipients reduced health inequities between high- and low-income groups.			
Systematic review	Improving healthy eating and beverage consumption through taxes and subsidies (25)	<p>The review found three sources of evidence: natural experiments; controlled trials of price changes; and modelling studies.</p> <p>Two studies of natural experiments were found. Both examined the implementation of relatively small taxes on sugar-sweetened beverages and neither found an association between taxes and the prevalence of obesity at a state level. However, it is thought that the taxation rate may have been too low.</p> <p>Results from randomized controlled trials suggest that taxation of unhealthy food items is effective. The studies warned that compensatory behaviour might occur away from the study environment.</p> <p>Most of the available literature uses modelling. U.S. studies predict a daily reduction in energy consumption of 29-209 KJ per person with a 20% tax. Modelling techniques show that a 20% tax on sugary drinks in the U.S. would reduce the prevalence of obesity by 3.5%. In other jurisdictions this reduction rate is likely considerably lower, reflecting a lower consumption of sugar-sweetened drinks.</p> <p>Studies that have examined taxation on food represent a small relative change compared to the taxes introduced. Two primary reasons for this are that food purchasing is relatively inelastic, and a relatively easy substitution with other non-taxed food. However, the review emphasizes that small differences can make large changes, with one included study finding that a value-added tax of 17.5% on unhealthy foods resulted in 900-2,700 fewer deaths in a year due to ischemic heart disease.</p> <p>The review found that health-related food taxes are often regressive, whereby poor people pay a greater proportion of their income in tax than do the rich. However, the review found that the health gains may be progressive and the health inequalities may be consequently narrow. The review also examined the acceptability of health-related food taxes, finding that opinion polls from the U.S. are supportive of sugared-beverage taxes at 37% to 72%.</p>	2012	1/10 (AMSTAR rating from McMaster Health Forum)	Not reported
Systematic review	Understanding the nature, extent and effects of food marketing to children (12)	<p>This review identified trends in food marketing, such as the dominance of TV as the most popular channel for promotion, over internet or mail-based promotion. It also identified the most commonly promoted food items, which include high-sugar breakfast cereals, soft drinks, snacks and fast foods. It was found that 63% of all food marketing spending was allocated for these foods to children, as well as juice, non-carbonated sweet beverages and candies.</p> <p>The use of animated characters, humour, action-adventure and fantasy were the most popular techniques to appeal to children on television. Purchase incentives were found to be increasingly common among TV advertisers, and it was also found that nutritional information in advertisements is sometimes misleading. In low- and middle-income countries, appeal to sports figures and celebrities was found to be a common advertising tactic.</p>	2012	7/11 (AMSTAR rating from McMaster Health Forum)	Not reported

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Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>Nine out of 16 studies examining the impact of advertising found strong relationships between marketing practices and changes in food preferences; these largely included changes toward foods with high fat, salt and/or sugar. It was also found that promotions for certain types of foods, such as low-fat options, increased consumers' tendencies to purchase such foods.</p> <p>Fourteen out of 18 studies found an association between food promotion and changes in children's behaviour, such as increased snacking on high-sugar, high-salt and high-fat foods, and an overall increase in total caloric content. However, it was also found that parental behaviours, such as adult snacking, TV viewing and food communication styles, have the greatest influence on the food consumption and preference patterns among children.</p>			
Systematic review	Examining the relationship between food marketing and the obesity epidemic (15)	<p>This review of economic literature found that pricing is the most influential market factor that affects increased energy intake and obesity. However, advertising and marketing factors such as branding were found to strongly influence public perception of common high-sugar, high-salt and high-fat foods and beverages.</p> <p>Naming foods like chewy candies as "fruit chews" for instance, was found to be a significant factor in taste expectations and retrospective evaluations of food quality. Labelling foods and beverages as "low fat" was also found to be a common and highly successful branding and marketing tool. Highly visible red or green labels indicating a "health check" or showing the logo of the American Heart Association have also been used by marketers to increase the appeal of certain foods to consumers.</p> <p>Increasing the amount of sugar, salt and fat in popular foods and beverages was found to be a common expectation amongst consumers for how popular, otherwise bland-tasting food items are made to taste better. Healthy brand extensions as subsidiaries of certain food companies has been shown to increase consumers' tendencies to purchase these products. However, it is unclear the extent to which these supposed "healthy alternatives" actually provide health benefits to consumers.</p> <p>"Supersizing" and providing larger package sizes has also been shown to be an effective marketing tool for consumers and a cost-saving measure for food manufacturing companies. There appears to be a lack of market incentives for marketers and producers to lower the offered consumption sizes for foods and beverages, particularly those that are high in sugar, salt and fats, because they increase processing and packaging costs. It has been found that supersizing is a significant factor which shapes the current model of food and beverage consumption. However, this is not beneficial for consumers, as it promotes over-eating and over-drinking.</p> <p>Overall, increased access to cheaper, higher-caloric density and bigger proportions of good-tasting poor-nutrition foods was found to be the chief reason for the current obesity epidemic. As well, nutrition information, health claims, and informational advertising have had a smaller impact than previously believed. Given that for-profit food companies that are less profitable than competitors</p>	2012	1/11 (AMSTAR rating from McMaster Health Forum)	Not reported

McMaster Health Forum

Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		are highly likely to be acquired by their rivals or go bankrupt, careful labelling and marketing have been crucial in the success of food companies in influencing consumer behaviour.			
Non-systematic review	Examining equity impacts of price policies to promote healthy behaviours (31)	<p>This study examined evidence from Latin America, central-eastern Europe, west Africa and south and east Asia. Overall, there was no evidence of a prevalence of tobacco use based on socio-economic status. An inverse relation was observed in several countries amongst men between socio-economic status and tobacco; however, the opposite pattern was observed among women. The opposite was found for alcohol, whereby high socio-economic status was found to be associated with a high prevalence of alcohol use in most jurisdictions examined. Similar trends were observed for high-sugar soft drinks as well as common low-nutrient, high-fat, high-salt snacks. The largest discrepancies observed for this trend are in India, where there is a more than three-fold difference in expenditure on such food and beverage items. The review indicates making such conclusions was difficult largely because prevalence of consumption is difficult to assess in low-income nations, and lacks the same distribution as higher-income countries.</p> <p>It was found that price policies would likely have progressive or neutral effects in most jurisdictions and potentially regressive effects in Guatemala and Nicaragua. The prevalence of consumption was found to be lowest in lower-income quintiles. For snacks, a regressive distribution of expenditure shares averaged across all households was observed in Guatemala, Nicaragua, Panama and Niger. Price policies for all items examined (tobacco, alcohol, soft drinks and snacks) were found to affect high-income households more than low-income households. Additionally, low-income households were found to experience the largest benefit of price policies which encourage healthy behaviours, primarily due to their strong response to price changes.</p>	n/a	n/a	n/a
Systematic review	The effects of nutritional labelling on healthy food purchase and consumption (18)	<p>In this review, most of the 28 studies assessed the impact of labelling on menus or menu boards, or nutritional labelling placed on various foods or drinks. Eleven studies assessed the impact of nutritional labelling on purchasing food or drink options, including purchases from vending machines, grocery store, or restaurants, cafeterias or coffee shops.</p> <p>It was found that within restaurants, energy labelling on menus would help reduce energy purchased per meal by 7.8%. However, the quality of evidence for these findings was low to very-low. Seventeen studies assessed the impact of nutritional labels on consumption in artificial settings or scenarios; however, no conclusive evidence on this topic was ascertained. As well, no evidence was found to indicate that nutritional labelling would harm consumers unintentionally by increasing the caloric content purchased or consumed.</p> <p>Overall, nutritional labelling comprising energy information on restaurant menus was the only evidence found in this review which had the potential to reduce energy content purchased. However, heterogeneity and low-quality evidence were cited as challenges to this supposed conclusion.</p>	2017	10/11 (AMSTAR rating from McMaster Health Forum)	2/28
Systematic review	Cost-effectiveness of nutrition interventions (16)	This review included 54 studies analyzing the cost-effectiveness of nutrition research, interventions and policies.	Not reported	1/10 (AMSTAR rating from	Not reported

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Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>The 54 studies included a total of 205 evaluations of nutrition interventions. These ranged from interventions that focus on food components (e.g., salt, fat, folate, and fibre), to interventions encouraging consumption of specific foods (fruits and vegetables), to interventions focusing on changing more proximal dietary disease risks (e.g., body mass, blood pressure, and cholesterol). Overall, the majority of the nutrition interventions were found to be cost-saving (17%) or cost-effective (less than one times GDP per capita, 55%).</p> <p>One intervention stood out for producing consistently favourable outcomes despite the many differences in analytical approaches. All five research groups that evaluated the regulation of salt in processed foods found that it is very cost-effective or even cost-saving (i.e., costs of treatment averted outweigh costs of intervention). One of the studies, which compared voluntary and mandatory approaches to getting food manufacturers to reduce salt, found that both strategies would be cost-saving, but the mandatory approach could achieve 20 times the health benefits for the population.</p>		McMaster Health Forum)	
Systematic review	Cost-effectiveness of interventions to promote fruit and vegetable consumption (17)	<p>This review included 23 studies analyzing the cost-effectiveness of interventions to promote fruit and vegetable consumption.</p> <p>Overall, the interventions evaluated were found to have potential for improving population health, but their relatively high costs made them generally cost-ineffective strategies for health sector investment. Out of 23 interventions, only five are cost-effective, and even the most effective interventions could avert only 5% of the disease burden attributable to insufficient intake of fruits and vegetables.</p> <p>Of the 23 interventions studied, eight were general population-level interventions, one was a supermarket intervention, seven were worksite interventions, three interventions took place in healthcare settings, and four interventions targeted low-income populations. Most interventions relied on multiple strategies to promote fruit and vegetable intake, such as counselling, mail-out of information, hand-out of promotional material, financial incentives and special promotional events. The majority of interventions (21 out of the 23) could avert less than 1% of the total health burden.</p> <p>The availability of evidence for evaluation of intervention effects was limited and of variable strength, with studies ranging from properly designed randomized controlled trial to before-after survey in intervention and comparison communities (e.g., community intervention program).</p>	2010	6/10 (AMSTAR rating from McMaster Health Forum)	Not reported
Systematic review	Cost-effectiveness of obesity-prevention interventions (22)	<p>The review included 18 studies in a qualitative analysis of the long-term (defined as <math>\geq 40</math> years) cost-effectiveness of obesity-prevention interventions.</p> <p>The interventions addressed were classified either as environmental, behavioural or community-based, and the majority of the 31 interventions evaluated were found to be cost-effective. Generally, environmental interventions were most cost-effective. All but one of the fiscal interventions, TV advertisement regulation, and adoption of nutritional food labels examined were cost-effective or</p>	2011	7/10 (AMSTAR rating from McMaster Health Forum)	Not reported

Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>cost-saving below US\$6,000 per QALY or DALY. Although these interventions resulted in only marginal health improvements, they were relatively inexpensive to implement and affected health at the population level.</p> <p>Behavioural and community interventions were also found to be mostly cost-effective, however, only two were found to be cost-saving. Failures of all of the four school-based interventions were largely attributed to health effects not clearly manifesting until decades after intervention delivery. Many behavioural and community interventions were accompanied by large per capita health benefits as well as large per capita intervention costs. The review notes that although many primary studies evaluated combinations of various community and behavioural interventions, challenges arose when interpreting their results due to methodological inconsistencies.</p>			

**Appendix 2: Summary of findings from primary studies about population-level policies to promote healthy eating**

Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
Examining the health and economic impact of reducing salt intake and altering fat consumption (44)	<p><i>Publication date:</i> 2011</p> <p><i>Jurisdiction studied:</i> Finland</p> <p><i>Methods used:</i> Economic analysis</p>	Finnish population aged 30-74 years	Predicting the health economic consequences of reductions in daily salt intake and replacement of saturated fats with polyunsaturated fats using a Markov model extrapolated from 2010-2030	<p>The primary health measure evaluated in this study was cardiovascular disease (CVD), which is the leading cause of mortality and healthcare costs in industrialized countries. Reducing salt intake and replacing saturated fat with polyunsaturated fats has been found to reduce the incidence of CVD. Annual age- and sex-specific healthcare costs associated with CVD in Finnish adults aged 30-74 years were obtained from national discharge and prescription registry databases. CVD rehabilitation costs were estimated using the national rehabilitation registry from the Social Insurance Institute of Finland.</p> <p>Overall, it was found that there was a dose-response relationship between reducing salt intake and substituting saturated fats with polyunsaturated fats, and reduced CVD biomarkers and associated risk factors. The study also suggests that up until roughly 2030, population-wide interventions for salt intake and fat substitutions may prevent up to 13,000 Finnish CVD cases. This correlates with estimated healthcare cost savings of up to 225 million euros. However, it was found that reduction of salt intake was primarily responsible for this prediction.</p>
Examining the cost-effectiveness and health impacts of policies to increase fruit and vegetable consumption (38)	<p><i>Publication date:</i> 2011</p> <p><i>Jurisdiction studied:</i> France</p> <p><i>Methods used:</i> Economic analysis</p>	French adult population in 2006	Quantifying economic and health effects of various policies by comparing the cost per statistical deaths avoided (DA) and life-years saved (LYS)	<p>The objective of the various policies compared in this analysis was to increase the amount of fruit and vegetable (F&amp;V) consumption. Currently, F&amp;V consumption in France is found to decrease with decreasing income quartile. The policies compared to increase F&amp;V consumption were a 3.4% reduction in value-added-tax (VAT) for F&amp;V, a 100 euros/person/year F&amp;V stamp for low-income consumers (LIC), and a 10 million euros information campaign.</p> <p>It was found that VAT reduction would lead to a 1.8% decrease in consumer price, but that this would benefit LICs less than other consumers; ultimately, this would marginally increase the health disparity index in France. Conversely, F&amp;V stamps were found to reduce disparities between LIC and higher-income consumers at the cost of only a very small increase in consumption. Two scenarios were considered for the information campaign: a pessimistic scenario, in which consumers were not responsive to generic information; and an optimistic scenario, in which they were. In both scenarios, health disparities were found to increase, however, the optimistic scenario was found to increase mean F&amp;V consumption overall. The study suggests that information-based policy may be more cost-effective than price-reduction policies through VAT reductions. However, these are subject to public receptivity to generic health-information campaigns.</p>
Examining the cost-effectiveness of labelling and taxing interventions to	<p><i>Publication date:</i> 2010</p> <p><i>Jurisdiction studied:</i> Australia</p>	Adult population of Australia in 2003	Using traffic-light-style food labelling and taxes on “junk food” items.	This study examined the cost-effectiveness of traffic-light-style front-of-pack food labelling and a tax on junk foods as two potential policies to prevent obesity. The traffic-light labelling intervention was combined with a one-year national social-marketing campaign to educate the public on how to interpret

Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
reduce obesity amongst adults in Australia (46)	<i>Methods used:</i> Economic analysis			<p>these food labels. Estimates of the model used were based on changes in bod mass index (BMI) and disability-adjusted life years (DALYs). Incremental cost-effectiveness ratios were calculated based on additional costs and associated health benefits of each population-level intervention.</p> <p>Both interventions were found to reduce mean weight and DALYs averted. The labelling intervention was found to cost \$81 million Australian, and the tax on “junk foods” was found to cost \$18 million Australian. However, analyses for both interventions demonstrated that they were both highly cost-effective, thereby providing good “value for money” as policy options to address obesity.</p>
Examining the cost-effectiveness of reducing sodium content and taxing high-sodium foods (47)	<p><i>Publication date:</i> 2010</p> <p><i>Jurisdiction studied:</i> United States</p> <p><i>Methods used:</i> Economic Analysis</p>	Adults in the United States aged 40-85 years	Models which accessed government collaboration with food manufacturers to reduce sodium in processed foods as well as a sodium tax	<p>This study implemented a Markov model of incidence, prevalence, mortality and direct costs associated with myocardial infarction (MI) and stroke. Population data regarding MI and strokes was retrieved from U.S. Census estimates.</p> <p>Government collaborations to reduce sodium in processed foods (primarily at the level of production rather than post-production preservation and processing) was projected to reduce sodium intake by adults by up to 9.5% (range: 5% to 40%). Taxing foods with excess sodium would also increase the overall price of high-sodium foods by up to 40% (similar to the effects of a cigarette tax). The projected increase in price was found to reduce sodium intake at the population-level by 6%. This can be expected to reduce average population-level systolic blood pressure up to 1.25-mm Hg, saving up to US\$32.1 billion in public health spending and possibly averting more than 500,000 strokes and more than 480,000 MIs in the United States. The overall increase in QALYs and reduced medical costs suggests these interventions may be cost-effective in reducing sodium-related cardiovascular disease events and mortality among adults.</p>
Examining the health effects and cost-effectiveness of reducing dietary sodium additives in the Canadian adult population (42)	<p><i>Publication date:</i> 2007</p> <p><i>Jurisdiction studied:</i> Canada</p> <p><i>Methods used:</i> Prospective cohort</p>	23,129 Canadian adults	Population-level reduction of dietary sodium additives	<p>Health benefits in the form of reduced blood pressure values and reductions in physician and laboratory costs were evaluated using models with data from the Ontario Health Insurance Plan (OHIP) from 2001 to 2003. Reductions in sodium intake were set at 1840 mg/day (based on the Canadian Heart Health Survey data) and were expected to reduce blood pressure by 5/2 mm Hg.</p> <p>Hypertensive patients who were hypothetically removed from existing drug treatments and assigned a 1840 mg/day sodium reduction were found to have the greatest benefit in terms of health outcomes (primarily reduced blood pressure and heart rate) as compared to those who only ceased existing medications. It was found that managing hypertension through this intervention would reduce annual health spending for hypertension in Canada by up to \$430 million/year. An additional cost savings of \$108 million/year was anticipated through reduced spending on physician and laboratory</p>

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Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
				services. Savings on antihypertensive medications were the primary contributor to overall cost savings. The study suggests this intervention would be highly cost-effective in reducing the health system burden of hypertension in Canada, and result in 1.3 million fewer physician visits. However, it also cautions against using this data across jurisdictions, as information from OHIP and the Canadian Heart Health Survey, as well as physician and laboratory expenses, may not be universally applicable.
Cost-effectiveness of media campaigns for low-fat milk consumption (52)	<p><i>Publication date:</i> 2005</p> <p><i>Jurisdiction studied:</i> United States</p> <p><i>Methods used:</i> Economic analysis</p>	Roughly one million TV viewers in West Virginia, U.S.	The <i>1% or less</i> media campaign broadcast over public television to recommend consumers to drink 1% milk	<p>This study analyzed the cost-effectiveness of the <i>1% or less</i> campaign to promote low-fat milk consumption. This campaign was achieved through four combinations of: 1) paid advertising, 2) media relations and 3) community-based educational activities (such as blind milk “taste-tests” in community settings).</p> <p>In one community of more 200,000 residents, it was found that a combination of all three strategies resulted in a 23% increase in low-fat milk consumption. Paid advertising and media-relations campaigns sustained a 42% increase in consumption up to two years post-intervention. However, communities that used media relations and community-based educational programs as well as those that only employed paid advertising schemes elicited non-significant increases in low-fat milk consumption. Overall campaign costs ranged from \$43,000 to \$61,000 (between \$0.10 per person and \$2.27 per person). A combination of paid advertisements and media campaigns was found to result in the most cost-effective intervention in one community, which experienced a turnover of 34% from those consuming high-fat milk to low-fat milk. This particular intervention was associated with a cost of \$0.10 per person to convert consumption habits. In all cases, media relations were found to enhance the effects of paid advertising. The study concludes that these findings highlight potentially cost-effective avenues for effective public health campaigns in reducing the consumption of high-fat foods and increasing the consumption of healthier alternatives such as fruits and vegetables.</p>
Nationwide expansion of a financial incentive program on fruit and vegetable purchases among Supplemental Nutrition Assistance Program participants (35)	<p><i>Publication date:</i> 2015</p> <p><i>Jurisdiction studied:</i> United States</p> <p><i>Methods used:</i> Economic analysis</p>	7,500 low-income households in Hampden County, Massachusetts	The Health Incentives Pilot (HIP) is a financial incentive program to make fruits and vegetables more affordable for Supplemental Nutrition Assistance Program (SNAP) households	It was found that program participation increased daily consumption of targeted fruits and vegetables by 0.48 servings among HIP participants 16 years of age and above. Based on a decision model estimation, the program has an incremental cost effectiveness ratio of \$16,172 per QALY gained. At a willingness-to-pay threshold of \$50,000-\$100,000 per QALY gained, the estimated net monetary benefit of a nationwide expansion of HIP to all SNAP households in the U.S. is \$2,767-\$6,857.
Effectiveness of cash incentives on	<i>Publication date:</i> 2016	Data from 100 consumers was scaled up to a population of	Three interventions were analyzed – a tax on unhealthy food, a subsidy	Results from the study suggest that cash incentives may be the most effective policy to tackle the obesity problem as it ensures a greater reduction in the number of people with unhealthy diets. Given the discount factor and the



Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
unhealthy food consumption (39)	<i>Jurisdiction studied:</i> United States and United Kingdom  <i>Methods used:</i> Economic analysis	304.37 million for the U.S. analysis, and 61.40 million for the U.K. analysis	to healthy food, and cash incentives in the form of a monetary reward to consumers who decrease their unhealthy food intake	presence of habit, most consumers' behaviour depends on their initial diets. Since most consumers initially choose unhealthy diets, motivating healthy food consumption via cash incentives has a significant negative effect on the aggregate level of unhealthy food consumption. Taxes in the form of a 10 per cent value added tax were found to be the least effective policy in reducing unhealthy food consumption. Subsidies in the form of a 10 per cent value subsidy, on the other hand, are relatively effective in reducing unhealthy food consumption. This is because of the differences in prices between healthy and unhealthy food; given the low cost of unhealthy food, a percentage tax on unhealthy food has only a small effect on the relative price difference between the two types of food, while the same percentage applied as a subsidy to healthy food has a much greater effect.
Consumer demand for diet quality: evidence from the healthy eating index (40)	<i>Publication date:</i> 2016  <i>Jurisdiction studied:</i> United States  <i>Methods used:</i> Economic analysis	3,670 American adults over the age of 20 from the National Health and Nutrition Examination Survey database	Consumer demand and factors affecting the demand for diet quality were studied; factors analyzed include income, education, and taxation and subsidies on foods	The results of the study demonstrated that age and education have a significant impact on consumer demand for diet quality, but income does not. Simulation of tax scenarios indicates that a tax on sugar-sweetened beverage may be more efficient than a tax on fats, oils and salad dressing in improving consumer diet quality.
Economic costs and benefits of promoting healthy take-away meals at workplace canteens (41)	<i>Publication date:</i> 2012  <i>Jurisdiction studied:</i> Denmark  <i>Methods used:</i> Economic analysis	Data from 3,657 survey respondents from Nielsen's online database were used to simulate the preferences of employees in Danish workplaces	The Canteen Takeaway (CTA) program promotes the utilization of the existing production capacity at workplaces to supply packaged meals for employees to bring home	The results of the study show that while most employees have a willingness to pay for the health attributes in canteen take-away meals, only a minority would actually pay for the canteen take-away concept. The potential health effects of the program were estimated to be positive, but modest in magnitude. The estimated costs of providing healthy canteen take-away meals exceeded the sum of average direct and indirect benefits. In conclusion, healthy CTA programs were found to be an economically sustainable intervention at some workplaces, though the analysis did not fully support a full-scale implementation of healthy CTA programs at Danish workplaces from a welfare economic perspective.
Examining incentives for dietary food improvements for food stamp recipients (43)	<i>Publication date:</i> 2010  <i>Jurisdiction studied:</i> United States  <i>Methods used:</i> Economic analysis	Data from 900 1996-1997 National Food Stamp Program Survey respondents were used to estimate demand elasticities	Two economic policies that use alternative policy levers available within the Supplemental Nutrition Assistance Program to increase consumption of fruits, vegetables and dairy products.	Results of the study suggest that a 10% price subsidy would curtail consumption deficiencies by 4% to 7% at an estimated cost of \$734 million a year. When the same \$734 million is used to finance food stamp benefits, consumption deficiencies are predicted to narrow by only 0.35% to 0.40%.
Comparing sweetener input tax to final consumption tax (45)	<i>Publication date:</i> 2011  <i>Jurisdiction studied:</i> United States  <i>Methods used:</i> Economic analysis	Data from the 2002 Consumer Expenditure Survey were used to estimate average American	Two tax policies to reduce added sweetener consumption – a consumption tax on sweetened goods and a sweetener input tax	Overall, the tax on sweeteners has a smaller impact on consumers' real expenditures and market welfare than does the tax on final products. The tax on Caloric Sweeteners causes a loss to consumers on a per capita basis (\$5.98). Although a bit larger, a tax on individual sweeteners is similar, with losses of \$6.65 from a tax on Sugars and of \$6.90 from a tax on corn sweeteners. Because the tax on final consumption has an equivalent variation

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Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
		population characteristics		loss about five times as great on all households and for each income group compared with the input tax on caloric sweeteners, taxing caloric sweeteners is the most efficient way to achieve the policy target based on the equivalent variation criteria.
Examining the impact of various pricing conditions on the intake of fast food and cafeteria food (48)	<p><i>Publication date:</i> 2009</p> <p><i>Jurisdiction studied:</i> Netherlands</p> <p><i>Methods used:</i> Prospective cohort study</p>	150 fast-food restaurant visitors and 141 workplace employees visiting a worksite cafeteria (all aged 18+)	Proportional pricing conditions (experimental group, food prices converted from the prices of medium size to the small and large sizes) and a value size pricing condition (control group, food prices representative of market prices)	<p>This investigation was split into two studies. In the first study, fast-food restaurant visitors were approached with a questionnaire which included pictures of different sizes of foods and drinks in order to determine their chosen portion of soft drinks and chicken nuggets and other dietary habits. The same procedure was followed for the second study, which involved workers at a workplace cafeteria (where hot meals were chosen as test foods). Parameters of hunger, thirst, dietary restraint, external disinhibition and value consciousness were evaluated based on the data collected.</p> <p>In the first study, 49% of participants chose the reference size of chicken nuggets. It was found that men were more likely to choose the reference size (containing six chicken nuggets) when confronted with proportional pricing; the opposite effect was found in women. Overall, 28% of participants chose the reference size of soft drink. A significant interaction was found between overweight status and pricing. Among normal-weight participants, pricing strategies had no effect on the likelihood to choose the largest size of food or drink. However, among obese participants, proportional pricing was found to reduce the likelihood of choosing the largest available food/drink size.</p> <p>In the second study, it was found that 21% of participants occasionally consumed a hot meal in the worksite cafeteria, and that 86.2% of participants chose the reference meal size. For those with a healthy weight, it was found that proportional pricing led to a 13.5% increase in choosing the reference meal size. No evidence was found to suggest different preferences for those of a higher weight in the cafeteria setting.</p> <p>Overall, the study found overweight fast-food restaurant visitors were more strongly restrained than visitors with a normal weight. However, no differences were found in value-consciousness (seeking the most value of food/drink for the money spent) and external disinhibition (eating food if it smells or looks appealing). Pricing strategies were found to help overweight consumers choose appropriate portion sizes. However, the methodological limitations and small sample in this study are also identified as factors that may not help its implementation in other contexts.</p>
Examining the health and cost outcomes of various policies to reduce sodium intake (49)	<p><i>Publication date:</i> 2016</p> <p><i>Jurisdiction studied:</i> New Zealand</p>	The 2011 New Zealand adult population aged 35 years or older	A dietary sodium intervention model which assessed 10 interventions to achieve sodium intake reduction targets	This study employed a Markov model with a 3% discount rate applied to costs and future health gain. It examined 10 interventions aimed at reducing sodium intake against a theoretical “do nothing” comparator as the typical model of practice. The “full target” was a 35% reduction in dietary salt, 5% beyond the WHO’s existing reduction recommendation. The analyzed

Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
	<i>Methods used:</i> Economic analysis			<p>interventions included reducing salt content in packaged foods, fast foods and restaurants, bread and processed foods, sauces, snack foods and cheeses. Costs of these various interventions (and combinations of interventions) were determined using information from existing national databases.</p> <p>It was found that for each intervention, a reduction in sodium intake was linked to a decreased blood pressure and improved health outcomes. The largest and most cost-effective gains were seen in the “mandatory approach” which reduced salt in packaged, fast foods and restaurant foods, as well as from discretionary use, by 35%. This resulted in a net gain of 235,000 quality adjusted life years (QALYs) gained over the lifetime modelled cohort. Interventions which adhered to the mandatory target of 35% sodium reduction were found to achieve targets at a 6% higher rate when interventions were voluntary rather than mandated. It was also found that the most cost-efficient reductions in salt intake would be reducing sodium content in packaged foods, fast foods and restaurant meals.</p>
Examining the impact of different taxation models on the demand for beverages (51)	<p><i>Publication date:</i> 2014</p> <p><i>Jurisdiction studied:</i> United States</p> <p><i>Methods used:</i> Economic analysis</p>	Not specified	Food and beverage taxes to influence beverage demand	<p>This study examined the gains in efficiency from a calorie-based tax model compared with an ounce-based tax model to influence the demand for high-sugar beverages. Sugar-sweetened beverages (SSBs) are estimated to account for up to 7% of the energy intake amongst Americans. The model used encompassed 178 beverages accounting for 95% of all non-alcoholic beverages in the U.S. market. Efficiency of the SSB tax was measured by compensating variation over 3500kcal beverage energy reductions. Various elasticity models and predictive algorithms were used to assess changes in market demand.</p> <p>It was found that the average unconditional own-price elasticity was -1.9 in all three models used. Roughly 50% of market products were not found to be adequate substitutes for SSBs. The effect of a 0.5% per ounce SSB tax was found to raise prices for beverages by 7.56% as compared to a 7.25% overall price increase from a 0.04% per kcal SSB tax. For every 3,500 beverage calories reduced, the estimated consumer surplus loss due to a calorie-based tax was found to be \$1.40 lower than the loss incurred from an ounce-based tax. It was projected that a 0.04% per kcal SSB tax would reduce beverage energy from supermarkets by 9.3% compared to 8.6% from a 0.5% per-ounce tax. This was correlated with per capita savings of \$2.35 in the United States each year.</p>
Assessing the effectiveness of single interventions versus policy approaches to address obesity (36)	<p><i>Publication date:</i> 2014</p> <p><i>Jurisdiction studied:</i> Australia</p>	Overweight and obese children and adults in Australia	A series of evaluations to understand priority-setting and policy implications	This analysis employed a solutions-based approach to obesity prevention and treatment using input from full economic evaluation studies that examined both health and cost-efficiency impacts. The study identifies that current, single-intervention evaluations do not provide sufficient insight into suitable policies or health-system interventions for obesity prevention and management. Single interventions are also found to be typically less cost-

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Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
	<i>Methods used:</i> Economic analysis			<p>effective than broader policies. An evaluation of the Assessing Cost-Effectiveness (ACE) methodology used by the WHO determined that ACE-prevention studies helped identify the cost-effectiveness of primary interventions and treatment, as well as those interventions focused on physical activity versus healthy eating.</p> <p>Overall, it was found that over half of the ACE studies were cost-effective; however, targeted treatment interventions were less cost-effective than holistic models and were mainly targeted toward weight loss strategies. The majority of policy interventions were found to be cost-saving and had incremental cost-effectiveness ratios of below \$6,000 Australian per disability-adjusted life year. However, program-based interventions such as the Weight Watchers program combined with pharmacological interventions were generally the least cost-effective, particularly in adults. Several cost-effective strategies were identified from ACE-prevention models, such as school curriculum programs or after-school programs. However, little evidence was found for the implementation of such strategies.</p>
Evaluating changes in fast-food and soft-drink consumption and obesity in children based on exposure to food advertising on television (37)	<p><i>Publication date:</i> 2011</p> <p><i>Jurisdiction studied:</i> United States</p> <p><i>Methods used:</i> Cohort study</p>	9,760 children followed up from kindergarten to Grade 8 with five intermediate assessments	Data collected from children via questionnaires and assessments in schools, as well as parental interviews, and teacher and school administrator questionnaire-based surveys	<p>This study examined changes in food consumption habits in young children with advertising trends on television. Overall, it was found that increases in TV advertising for certain foods and beverages increased children's tendency to consume those items. For example, a 100% increase in advertising for carbonated soft drinks correlated with a 6.5% increase in children's consumption of these beverages, and a 1.3% increase in consumption in response to fast-food advertising. This particular finding suggests the intricate and complementary nature between fast-food and soft-drink advertising.</p> <p>There was no significant association between advertising measures and fruit and vegetable consumption; instead, it was found that only cereal advertising predicted lower milk consumption. As a result, these findings suggest that children's exposure to advertising for calorie-dense nutrient-poor foods is associated with increased overall consumption of these types of foods which are commonly advertised to children.</p>





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